15 Cents AUGUST, 1908 $1.00 a year

# THE FOUNDRY

H. L. WILLIAMS
CHICAGO

R. B. HICKMAN
LOUISVILLE

## Hickman, Williams & Co.

F. M. EATON
CINCINNATI

EXCLUSIVE AGENTS

PITTSBURG—CINCINNATI—AND WEST
WATTS—DORA—CROZER—RADFORD
BRISTOL—MAX MEADOWS—RED
RIVER—HELEN—DOVER
TUSCALOOSA

WESTERN AGENTS
CHATTANOOGA
SILVER CREEK
STANDARD
WOODWARD—TRUSSVILLE
SALISBURY—MUIRKIRK

**BASIC**
**LOW PHOSPHORUS**
**FERRO PHOSPHORUS** **FERRO MANGANESE** **FERRO SILICON**

—OFFICES—

CHICAGO CINCINNATI LOUISVILLE ST. LOUIS PITTSBURG

*MANUFACTURING SINCE 1874*

We are headquarters
" " prompt shippers
" " most liberal in our terms
" " anxious for your orders for

# "Everything you need in your Foundry"

—— Our Specialties are ——

**702 Ceylon Plumbago**
**"Kantbebeat" Dry Core Compound**
**"Esso" Liquid Core Binder**
**Cream Talc**
**"Esso" Plumbago Core Wash**

And

**Sea Coal or Bituminous Facings**
(Ours is the largest Sea Coal factory in the World)

## *The* S. Obermayer Co.

**CINCINNATI CHICAGO PITTSBURGH**

**Canadian Agents: The Dominion Foundry Supply Co., Toronto and Montreal.**

**OFFICES AND REPRESENTATIVES:**

Milwaukee, 696 Prospect Ave. Cleveland, 6305 Euclid Ave. Denver, 305 Appel Bldg. & 620 19th St.
Troy, Campbell's Highway & Thomas St. Brooklyn, 276 78th St Kansas City, Massachusetts Bldg.
St. Louis, 1604 N. Broadway Toronto and Montreal, Canada. San Francisco 208 First St

*MANUFACTURING SINCE 1874*

From the manufacturer to the individual user — **exclusively** for the Foundry trade —

**RIDDLES or SIEVES**
**(Brass or Galvanized)**
**SNAP FLASKS**
**BENCH RAMMERS**
**MOLDERS' BRUSHES**
**TUMBLING MILLS**
**LADLES**
**CORE OVENS**

General Selling Agents for

**WHITING CUPOLAS**

Also Estimates Furnished on Complete

**SAND BLAST CLEANING APPARATUS**

***General Catalogue No. 40-E sent to any foundryman free of charge.***

# *The* S. Obermayer Co.

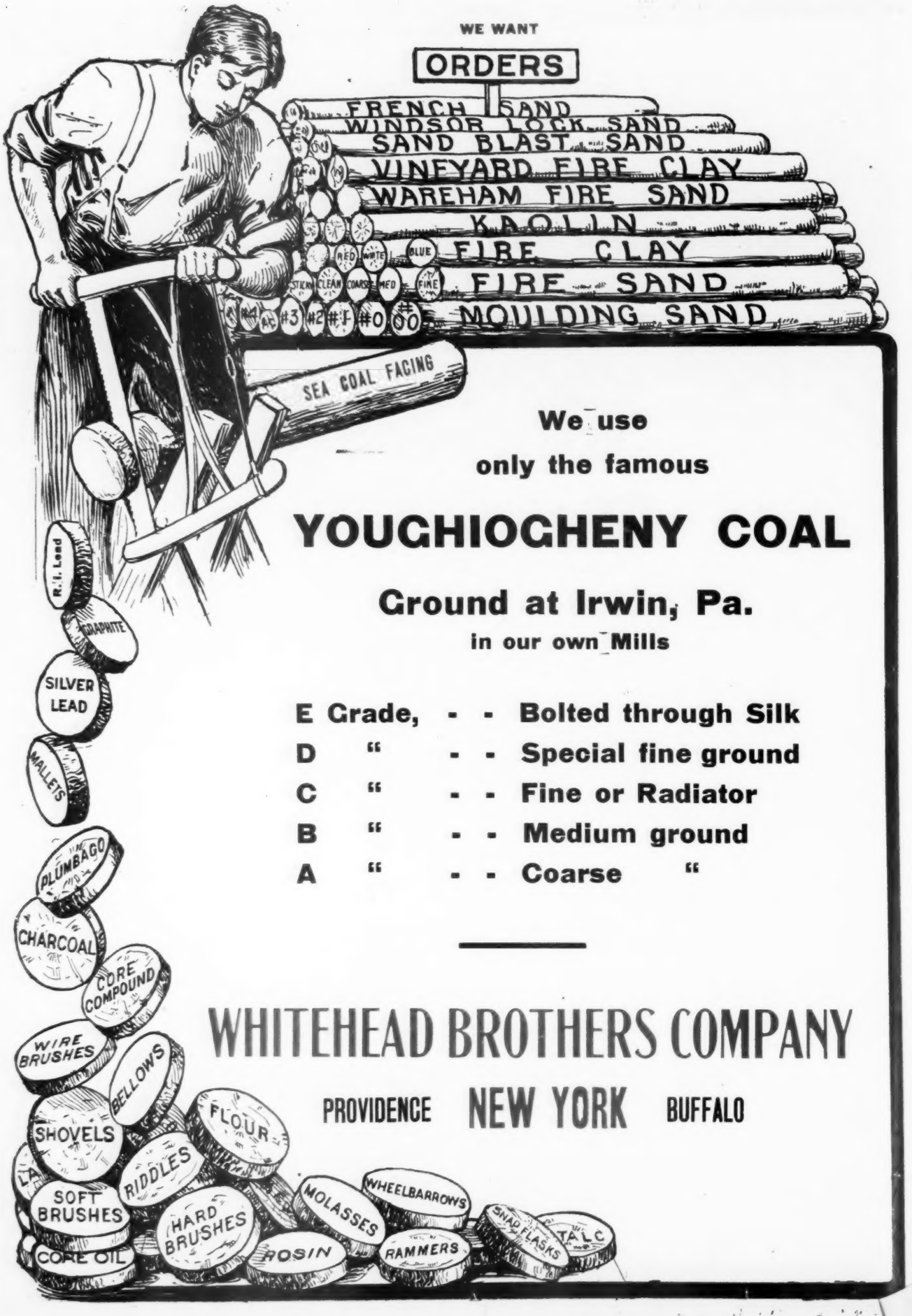
**CINCINNATI CHICAGO PITTSBURGH**

**Canadian Agents: The Dominion Foundry Supply Co., Toronto and Montreal.**

**OFFICES AND REPRESENTATIVES:**

Milwaukee, 696 Prospect Ave. Cleveland, 6305 Euclid Ave. Denver, 305 Appel Bldg.
Troy, Campbell's Highway & Thomas St. Brooklyn, 276 78th St. Kansas City, Massachusetts Bldg.
St. Louis, 1604 N. Broadway. Toronto and Montreal, Canada. San Francisco, 208 First St.

EVERYTHING YOU NEED IN YOUR FOUNDRY




We use
only the famous

# YOUGHIOGHENY COAL

## Ground at Irwin, Pa.

in our own Mills

| | | | |
|---|---|---|---|
| E Grade, | - - | Bolted through Silk |
| D | " | - - | Special fine ground |
| C | " | - - | Fine or Radiator |
| B | " | - - | Medium ground |
| A | " | - - | Coarse " |

# WHITEHEAD BROTHERS COMPANY

PROVIDENCE **NEW YORK** BUFFALO

# SAND BLAST LOGIC

Number 1

**WE know** that we can make a **Sand Blast installation** that will pay for itself in less than six months in most any foundry. How do we know? Simply by the fact of what we are doing daily.

You know the size of your plant, but perhaps **you are doubtful** of the possibility of such a result as that stated above, so far as it concerns your particular shop. Why continue to labor under this doubt when it's **nine** chances **to one** that you are being the loser by several dollars a day, and when without its costing you a penny **you can know** just what a **Modern Sand Blast System** will do for you in saving labor and improving castings.

**We will make** an installation on approval for any responsible concern with the understanding that unless we demonstrate that it is possible to make the equipment **pay for itself** in **six months,** it is subject to return at our expense.

Having one of our cleaning-room experts go over your present cleaning facilities will mean the saving of hundreds of dollars to you. Act now. A postal will do your part. At present while things are possibly quiet with you is the opportune time. Our claims can all be substantiated by the representative shops of the country who are numbered among our users.

THOMAS W. PANGBORN COMPANY

FACTORY
WAREHOUSE AND SHOWROOMS
HUDSON AND MORRIS STS.
JERSEY CITY, N. J.

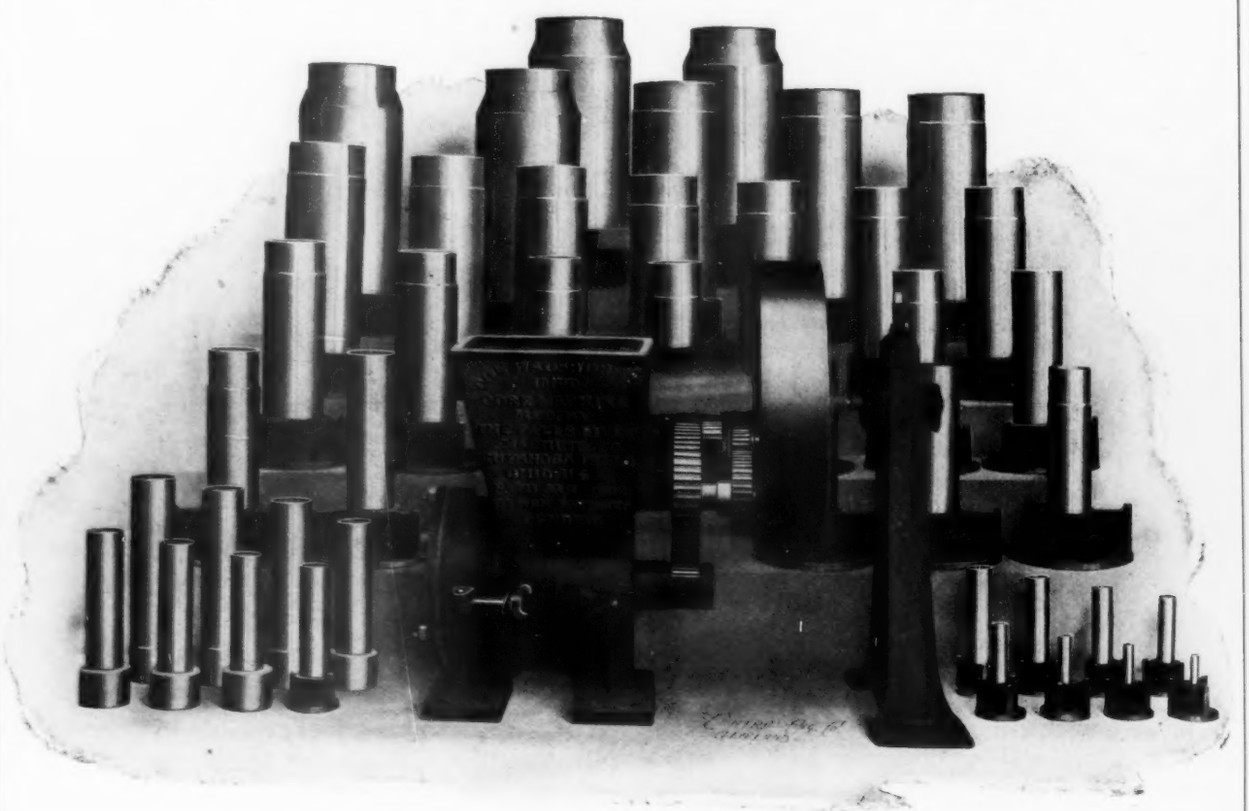
NEW YORK
General Offices, 87 West Street
New York Store, 53 Dey Street

SPECIALISTS
IN LABOR-SAVING AND IMPROVED
PRODUCT PRODUCING EQUIPMENT FOR FOUNDRIES

112

# THE WADSWORTH
# Improved Core Machines

**The only Core Machine manufactured that can make a Rodded Core. Any size Rod can be used. Hand or power driven, makes round Cores from ⅜″ to 7′. Also irregular shapes. 40 sizes of Cores, all made on one Machine.**



**We are Core Machine Specialists.**

Compare your time with that of THE WADSWORTH Machine.

**One 6′ Core, 24′ long, by hand power in 12 seconds.**
**One 7′ Core, 5′ 3″ long, by hand power in 80 seconds.**

The great strength and accuracy of cores, together with the wide range of shapes possible, make them a valuable foundry investment.

*Write for prices and descriptive catalogue.*

## The Falls Rivet & Machine Company
Cuyahoga Falls, Ohio, U. S. A.

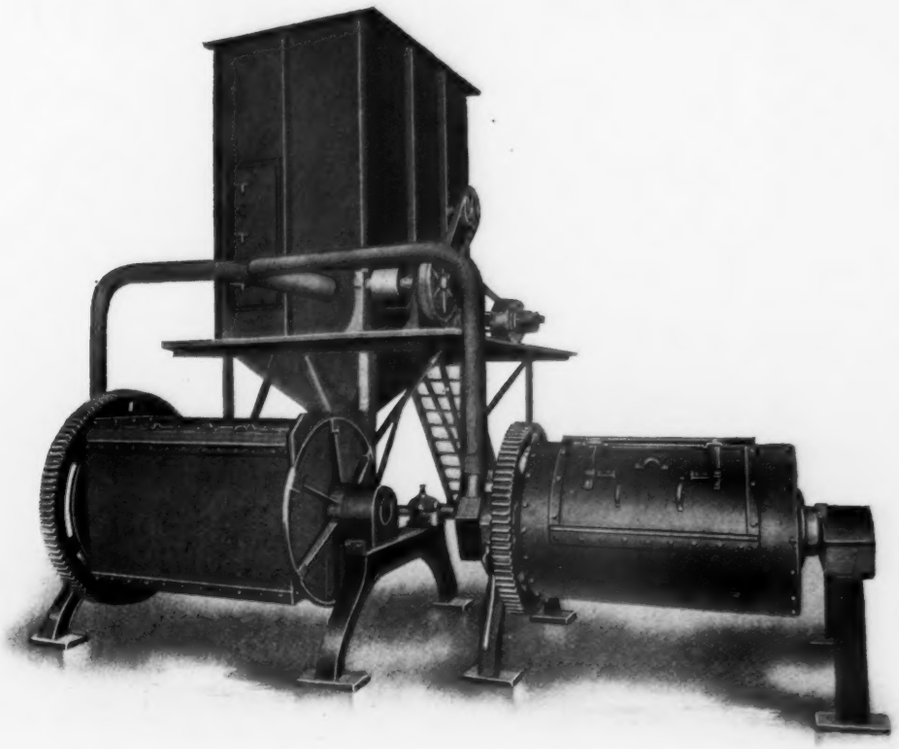
FOREIGN AGENTS:

J. W. JACKMAN & Co., Ltd., Caxton House, London, S. W.

FRANZ KUSTNER, Dresden, Germany.

THE HAMILTON FACING MILL CO., Ltd., Hamilton, Ont., and Montreal, Que.

# A Clean Mill Room



The above cut shows two of our UP TO DATE EXHAUST MILLS properly piped to our patent steel case Dust Arrester. The only way to get good results in cleaning your castings is to put in first-class Exhaust Mills. The old time stave mill has long since seen its doom, and it is being replaced by steel exhaust mills of the improved type.

The only way to get your castings perfectly clean is to take away the dust and dirt as fast as it is scratched from the castings. If you blow the dust in the yard it will sift back into the shop and destroy more machinery than the cost of the Arrester. It must be confined and the only way to do this is to pipe it to one of our improved Dust Collectors, which keeps your Mill Room free from dust, saves wear and tear on your machinery and saves the life of your exhaust fan as no dust passes through the fan. By this collector method your castings are cleaned in one-third the time and present a bright, clean surface.

With your permission, we will be glad to figure on outlay for your Cleaning Room and give you the benefit of our many years experience.

*Write for our new Catalog on Cleaning Room Science.*

---

**THE W. W. SLY MFG. CO.**

**Cleveland, O.**

MANGANESE-BRONZE

**The best and strongest Manganese-Bronze is made from our Manganese-Copper, free from iron and other impurities.**

---

WE SUPPLY THE ALLOY READY TO MELT AND ADD ZINC.

***Write for particulars and prices.***

---

We also make

Silicon Copper,

Aluminum Bronze, Different Grades,

Light Aluminum Casting Alloys, and Alloys to Order.

---

**The Electric Smelting & Aluminum Co.**

**LOCKPORT, - - - NEW YORK.**

# CORE OVENS

CORE OVENS

The J. D. Smith Foundry Supply Co.

FOUNDRY ENGINEERS

Cleveland, Ohio

## SAND BLASTING EQUIPMENT

**Low Pressures, Large Nozzles**
**Rapid Effective Cleaning**

A perfectly clean casting is an order getter, and the wise foundryman knows it and the purchasing agent is beginning to specify sand blast cleaning.

*Get in Right*

PATTERN—Stove Door.
EQUIPMENT—One Single Stand Rock-over Machine and "Dummy" for Cope.
FLASK—15½"x 19¼" inside.
OUT-PUT—One man puts up and pours 85 Flasks per day.

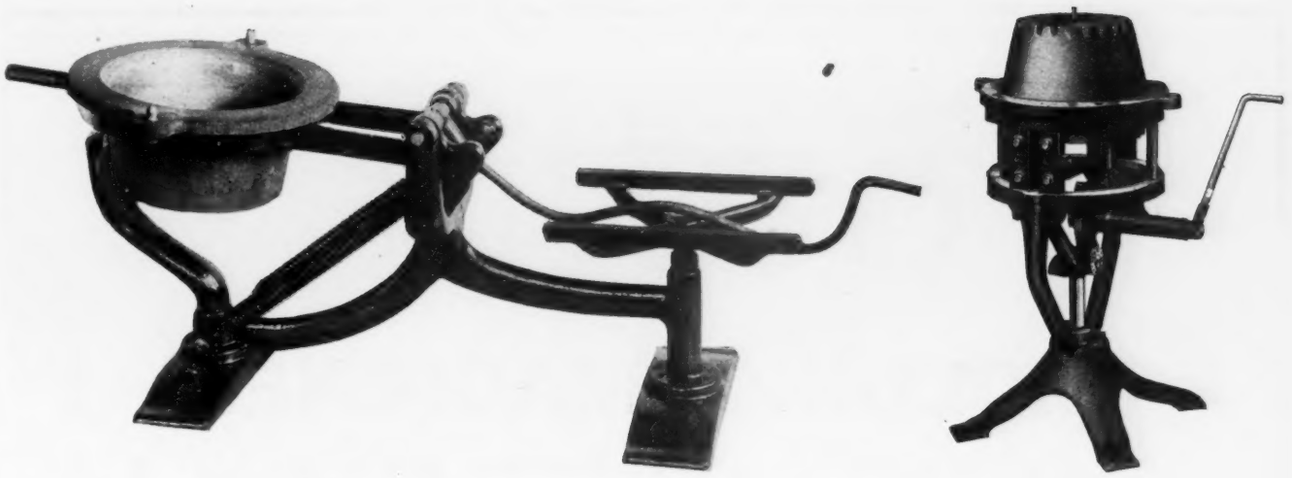
PATTERN—End Shelf.
EQUIPMENT—One Double Stand Rock-over Machine; Cope is made on a "Dummy".
FLASK—11¼" x 28¼" inside.
OUT-PUT—Two men put up and pour 220 Flasks per day.

---

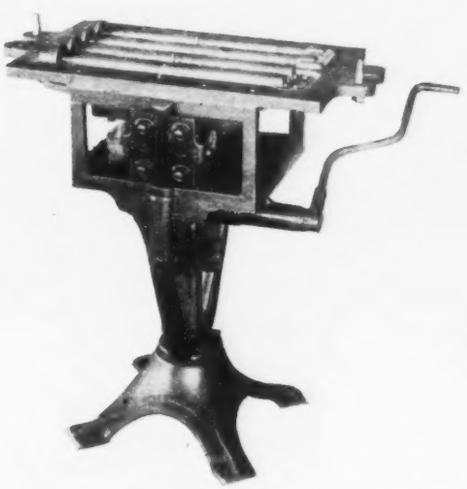
If you have not received a copy of our STOVE PLATE Catalogue, please write for one.

---

**Henry E. Pridmore**
**Chicago, Ill.**



PATTERN—Fire Pot.
EQUIPMENT—One Single Stand Rock-over Machine and one 14" Round Stand Machine.
FLASK—15½" Inside Diameter.
OUT-PUT—Two men put up and pour 170 Flasks per day.



PATTERN—Gas Oven Burners.
EQUIPMENT—One 12" Square Stand Machine.
FLASK—12" x 22" Inside.
OUT-PUT—One man puts up and pours 90 Flasks (360 castings) per day.

---

The PRIDMORE Molding Machines are operated by ordinary laborers. They can be used for castings required in SMALL as well as large quantities.

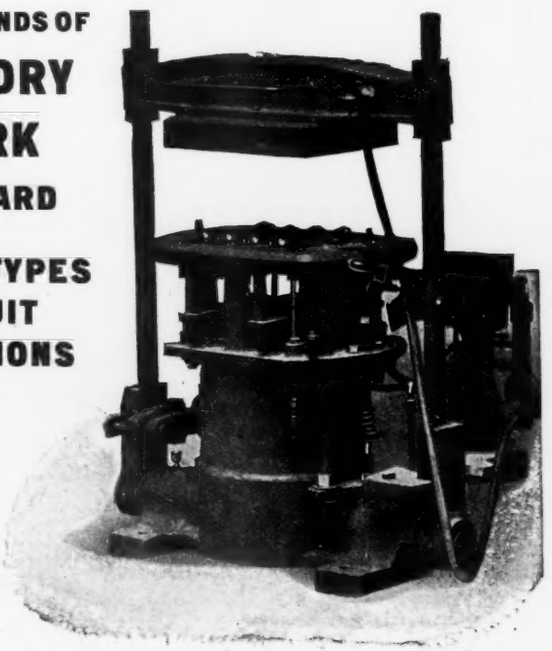
---

**Henry E. Pridmore**
**Chicago, Ill.**

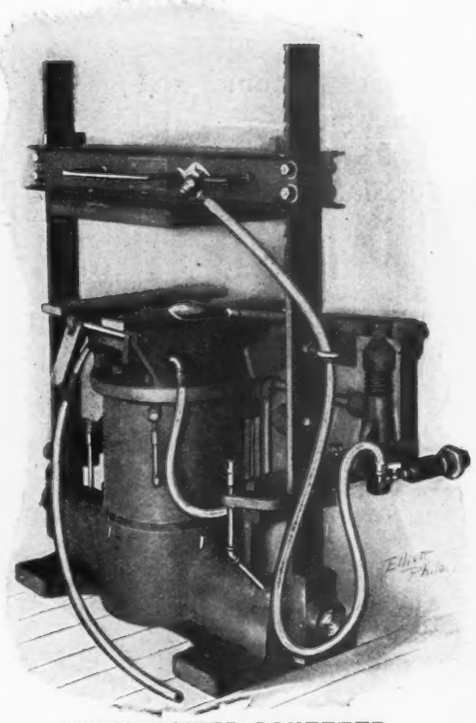
# FOUNDRY

## MOLDING MACHINES

FOR ALL KINDS OF
**FOUNDRY WORK**
STANDARD
AND
OTHER TYPES
TO SUIT
CONDITIONS



POWER SQUEEZING SPLIT PATTERN MACHINE
Made in All Standard Sizes



LIGHT POWER SQUEEZER FOR BENCH WORK

HINGED MACHINE FOR GENERAL JOBBING WORK

THE
**TABOR MFG. CO.**

18th & HAMILTON STS.
**Philadelphia, Pa.**

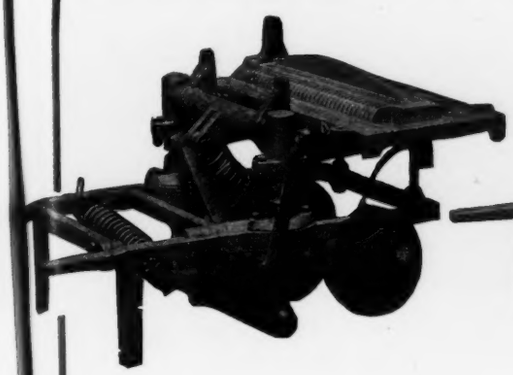


Fig. 1. This cut shows the machine with a grate bar pattern attached to the molding board.

Fig. 2. Here we see the drag flask placed in position over the pattern ready for filling.

Fig. 3. The operation of ramming the drag in the ordinary hand-molding way.

# Tabor Molding Machines

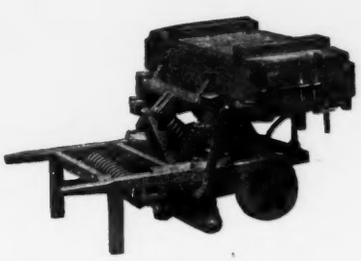


Fig. 4. Showing the bottom board, the mold board, and the drag all clamped together and ready to turn over for vibrating or rapping.

**Our latest product speedily shows a saving equal to its cost. Its use means quicker and more accurate work than is possible by hand. Its wide adaptability and economy will be self-evident after an examination of the cuts shown on this page.**

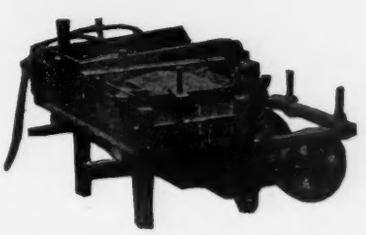


Fig. 5. The entire mold has been turned upside down on its hinge. This is easily done by one man as explained under "Turning and Vibrating."

## The Tabor Manufacturing Company

**18th and Hamilton Streets, Philadelphia, Pa.**

Fenwick Freres
Paris

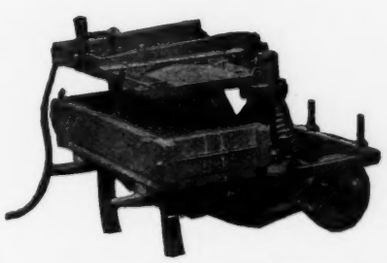


Fig. 6. The mold board and pattern are raised in a positively vertical direction by the handle at the front of the machine.

Fig. 7. Turning over the pattern.

John Macdonald & Son
York St., Glasgow, Scotland

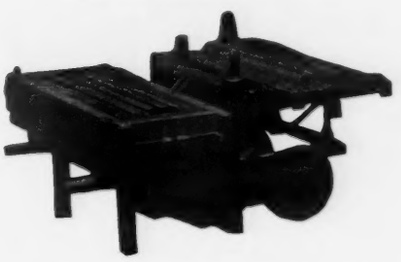
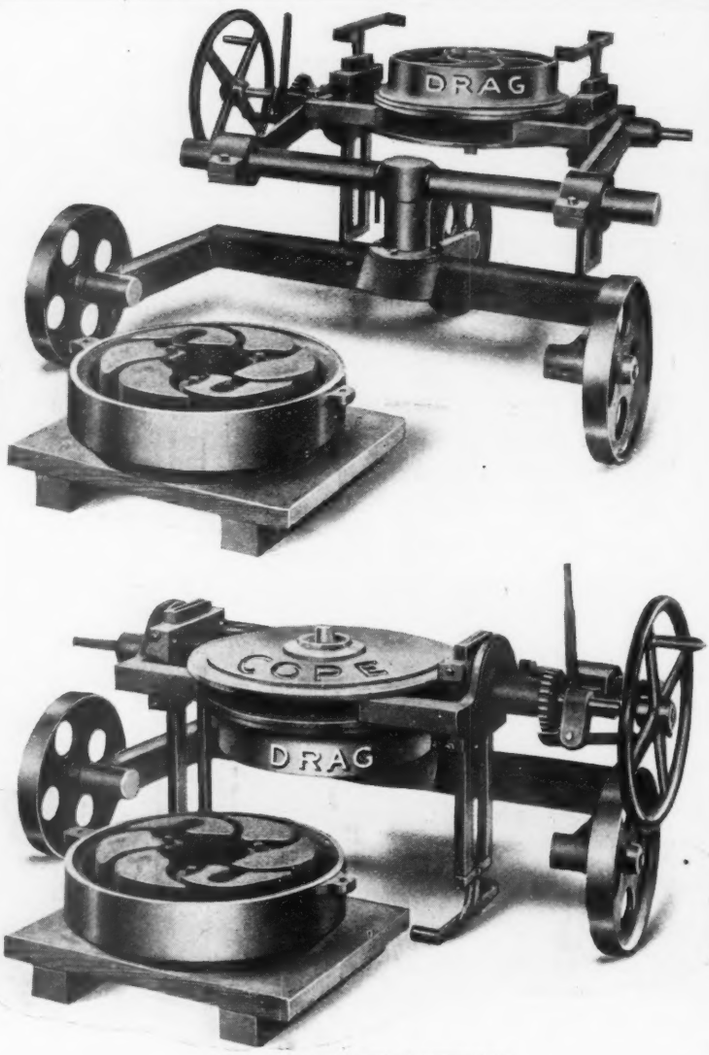


Fig. 8. Here we see the mold board back in the same position as in Fig. 1, while the drag of the mold is ready to be set on the floor before the machine is moved forward.

**Built in Three sizes to take Flasks**
**36" long, 24" wide**
**48" long, 36" wide**
**60" long, 40" wide**

**We can build special sizes if necessary**




MINE CAR WHEEL PATTERN
Fitted to Machine

**Our Rollover Machines are adapted for such work as Boiler Fittings, Valves and Fittings, Scale Castings and a large variety of general work.**

# Mr. Foundryman:

You have had time to think over the several types of Molding Machines you looked over at Toronto, and we believe you are now satisfied the Killing Rollover Straight Drop Machine is the best of them all.

Some of its advantages are—

It is easiest to operate, and easiest on operator; therefore can get larger output.

The only machine that delivers the drag mold, on foundry floor in pouring position, saving heavy lifting.

Cope and drag patterns can be mounted on same machine.

If you have any patterns you are thinking of putting on machines, we hope you will allow us to give you figure on machines suitable for your work.

---

## E. KILLING'S MOLDING MACHINE WORKS

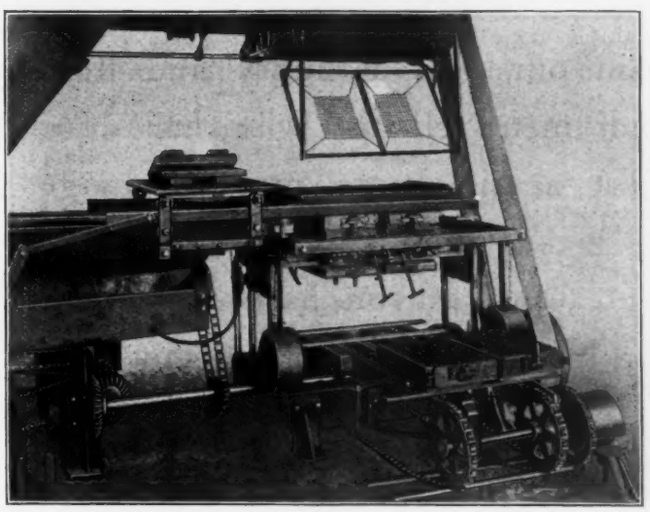
DAVENPORT, IOWA.

# A New Automatic Molding Machine

**TO MAKE YOUR FOUNDRY PAY LARGER PROFITS you have your choice of two methods—either charge more for your castings or reduce the cost of production.**

If it were not for your competitors you could easily raise the price, but as long as the other fellow keeps down his price you are helpless. But you can reduce the costs and the cheapest and safest way to do this is to mount every possible pattern on one of the Arcade Molding Machines.

If your castings are light in weight, one of the three styles of "Modern" Machines will cut the cost of your castings from 25 to 40 per cent.



If you have five or six molders, all making the same castings, one of our Automatic Power Molding Machines will do the work of all of them at an enormous saving in cost of labor.

If you do floor molding you are paying too much for your castings, unless you are using Arcade Roll-Over Machines.

You cannot afford to pay more for your castings than the price at which they can be produced on Arcade Molding Machines. If your competitors are cutting prices you can depend upon it that they are using Arcade Molding Machines.

You may be making your castings at the lowest possible price but you don't know this to be a fact until we have told you what can be done with your patterns mounted on Arcade Molding Machines. If you will send us samples of doubtful castings or blue prints of them, we will gladly give you an accurate statement of what Arcade Machines will do with them.

This service will not cost you a cent, and certainly it should be some satisfaction to you to know whether your castings are costing you too much money or not.

Every day you delay action may cost you a 25% profit on your out-put, so write us now before it escapes you.

## ARCADE MFG. CO.

FREEPORT, ILL., U. S. A.

# You have read our Ads for years, and fully understand how simple a mould is rammed on a

# Herman Jarring Moulding Machine

From experience in our own Foundry and from what other Foundrymen tell us, who have our machines; it is just as simple to ram up Large Cores as it is to make moulds. We take your core boxes, rods, etc., just as you have them, and place same on our machine and ram up any

# Large Core in One Minute

We made them at Toronto Convention.
Didn't you see us?

---

## Herman Pneumatic Machine Co.

**ZELIENOPLE, PA., U. S. A.**

FOREIGN REPRESENTATIVES:
Pneumatic Engineering Appliances Company
Palace Chambers, Westminster, London, England.

# Gravity Moulder

When you see the Gravity Moulder in operation you will appreciate the difference between a sure-enough Moulding Machine and a mere pattern drawing device, or an apparatus performing some function in the manufacture of a mould. A device that merely draws patterns from the moulds after the latter are made by hand is not a moulding machine. It don't pay to use machinery that won't make moulds when you can get a machine that will, especially when it can be demonstrated to your satisfaction that the use of such a machine will mean a large profit to you over that which you can realize by the use of any other device or combination of apparatus.

The Gravity Moulder is a sure-enough Moulding Machine. It performs all the functions of such a machine in a perfect manner.

**1st. It riddles the sand.**
**2nd. It delivers the sand to the flask.**
**3rd. It rams up the mould perfectly uniform throughout, regardless of the shape and size of the pattern.**
**4th. It strikes off the surplus sand.**
**5th. It turns or rolls the flask.**
**6th. It draws the pattern perfectly straight from the mould.**

The machine does all this in less time than it takes to tell about it and with but a single man to control and operate it. The fact that all this can be accomplished by one simple machine is simply due to the fact that the principle of moulding by Gravity is the correct one. Such a machine would not be possible if constructed to utilize any other principle.

The Gravity Moulder fills and rams up a large size mould in less time than two men can shovel the required amount of sand into the flask, and it rams up the mould more uniformly throughout than is possible by any other means or method or even by hand, by reason of which moulds made by this machine always make perfect castings.

When equipped with this remarkable invention, with the necessary equipment for handling the flasks and moulds to and from the machine, the operation of your foundry will be a pleasure as well as very profitable.

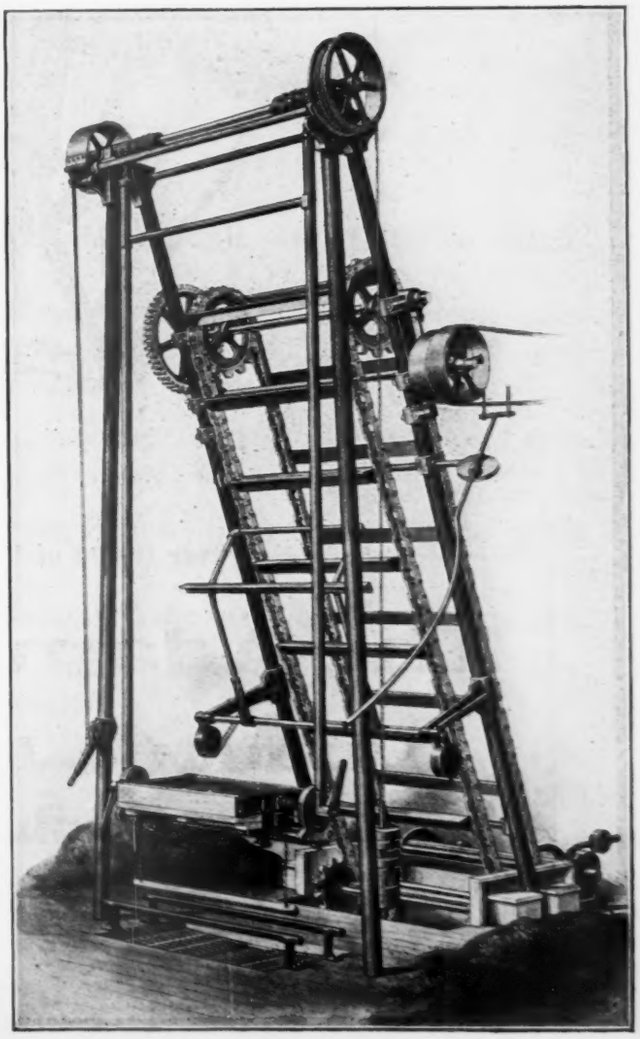
*Inquiries cheerfully answered.*

MANUFACTURED BY

**A. BUCH'S SONS CO.**

**ELIZABETHTOWN, PENN'A**

Exclusive Canadian Manufacturers
ONTARIO WIND ENGINE & PUMP CO.
Toronto, Ont.



# MOLDING PRESSES AND MACHINES

SEND FOR CATALOG No. 11.

Over 10,000 of Our Machines in Use

## The Adams Company

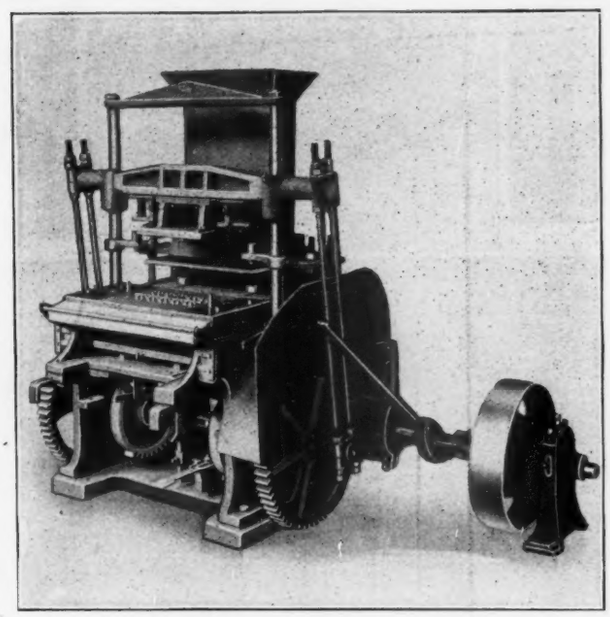
## Dubuque, Iowa, U. S. A.

J. W. Jackman & Co., London, S. W., England.
H. Glaenzer & Perreaud, Paris, France.
V. Lowener, Copenhagen, Denmark.
Ing. G. Pontremoli & Co., Milan, Italy.

# THE BERKSHIRE AUTOMATIC MOLDING MACHINE

Every Operation Automatic.

Its capacity has never been equaled.



Investigate Recent Improvements.

It will pay you handsomely.

THE IMPROVED BERKSHIRE

**THE ONLY AUTOMATIC MOLDING MACHINE IN THE WORLD.**

Its ease of operation, accuracy and perfection of the molds insuring perfect castings, prove it to be the best and most up-to-date machine yet devised, and above all *reducing* foundry *expenses* anywhere from *25%* to *60%*.

The machine does *all* the work, no molders required; every mold is rammed alike and vibrated alike, insuring absolutely uniform castings.

Split Pattern Plates, Stooling Plates, Stripping Plates. Sixty to one hundred molds per hour with ease.

Place the flask on table, press the foot lever and the machine does all the rest.

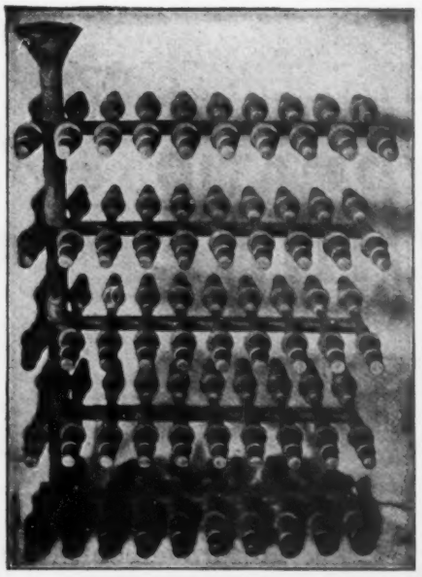
Only one horse power required to operate. Absolutely positive in all its movements. No intricate parts to wear or get out of order.

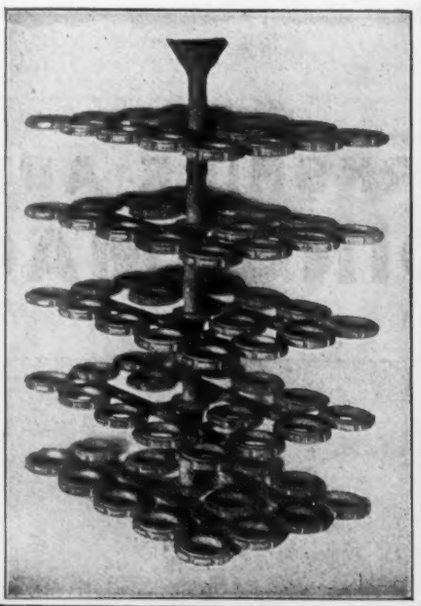
***Send for our illustrated catalogue.***

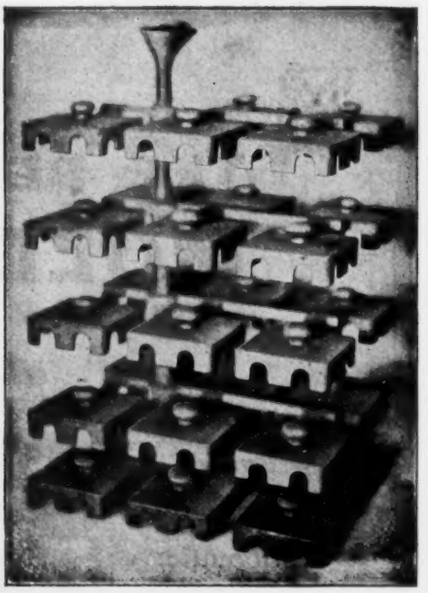
## The Berkshire Manufacturing Company

**CLEVELAND, O.**

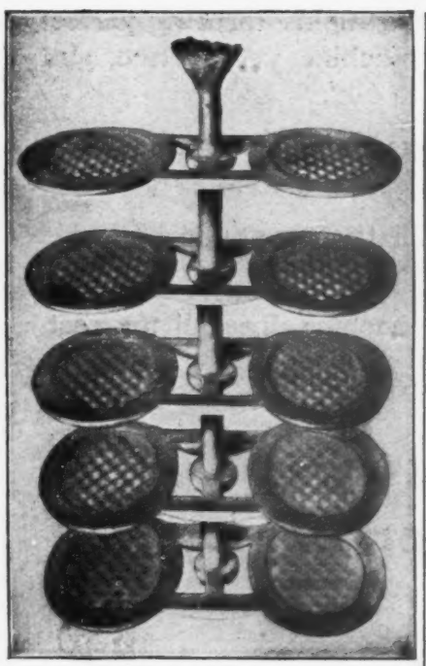
**U. S. A.**

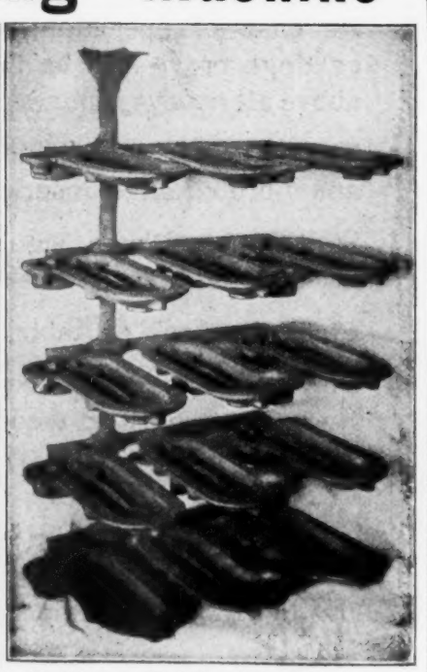






# Rathbone Multiple Moulding Machine





**The Fastest Method of Moulding**
Combined with the
**Greatest Economy of Floor Space**

**Rathbone Molding Machine Co.**
**44 Buhl Block**
**DETROIT**

# Mumford Vertical Mold Table

**Immediate disposal and storage of 175 12" x 16" molds in floor space 6' x 12'.**

And---

The operator does not have to carry his molds from machine nor bend his back to place them on the floor; a great saving of labor as well as floor space.

With sand supplied to machine from hopper, you can get from ANY ONE of your molding machines all the speed of the horizontal mold table shops—and this is 3 to 4 times speed of shops without these.

With Horizontal Mold Table the whole shop is tied up on one unit—with MUMFORD VERTICAL MOLD TABLE each machine floor is an independent operation.

This is an absolutely new and original foundry system, and patent to E. H. Mumford is applied for.

*Write us for full information.*

**THE E. H. MUMFORD CO.**

**1225 Spring Street,**

**Philadelphia, Pa.**

# IRON—vs—STEEL

**Iron flasks are one of the most expensive equipments that you can put in your foundry.**

To enumerate their expensive and undesirable qualities is to speak of points with which you are most familiar. But to make a comparison we will repeat them.

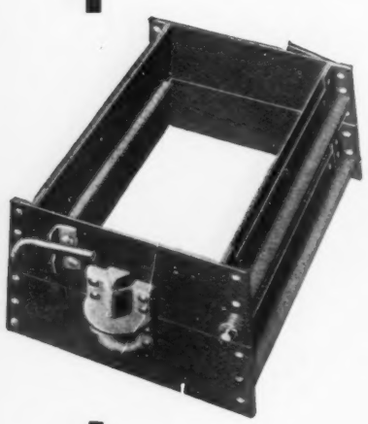
**1**—The average cost of Iron Flasks is $2.00 each. If your man can put up 100 molds per day you have an investment at the start of $200.00 per floor.

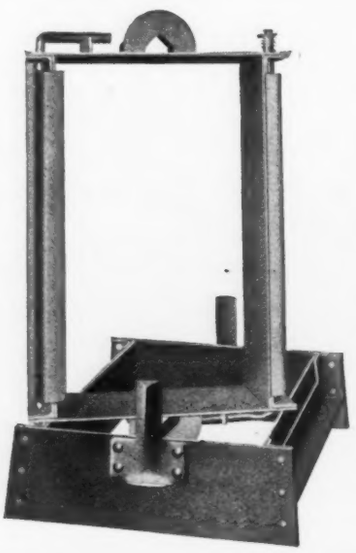
**2**—Two or three runways or aisles are required on every floor to facilitate pouring.

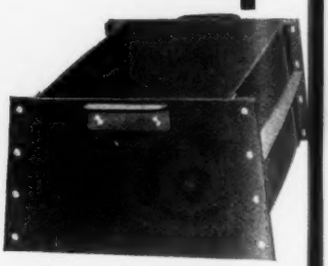
**3**—No matter how well the flasks are made or how carefully the mold is prepared, you are bound to have run-outs occasionally.

**4**—At night each flask has to be picked up, shaken out and carried the length of the floor and stacked.

**5**—Breakage and repairs are a continual source of trouble and expense and adds greatly to the first cost.







## The Macphail Patented Steel Flask eliminates every one of these undesirable features

1* One Macphail Outfit (1 cope, 1 drag and 6 jackets) will cost you $40.00 F.O.B. Chicago. It will take care of one floor and with the same labor will give from **15**% to **30**% more product. Compare this with your investment in iron flasks.

2* No runways or aisles required with the Macphail Method. The molds are bunched on the floor and moved back as fast as poured. A saving of **25**% of floor space.

3* Run-outs are **absolutely** impossible. A perfect match between the cope and drag (which never wears) together with the steel slip boxes or jackets which hugs tight to the mold eliminates this danger.

4* At night you have but **Six** Jackets to pick up and stack, no shaking out or carrying. After the molds are dumped the floor is practically cleaned up.

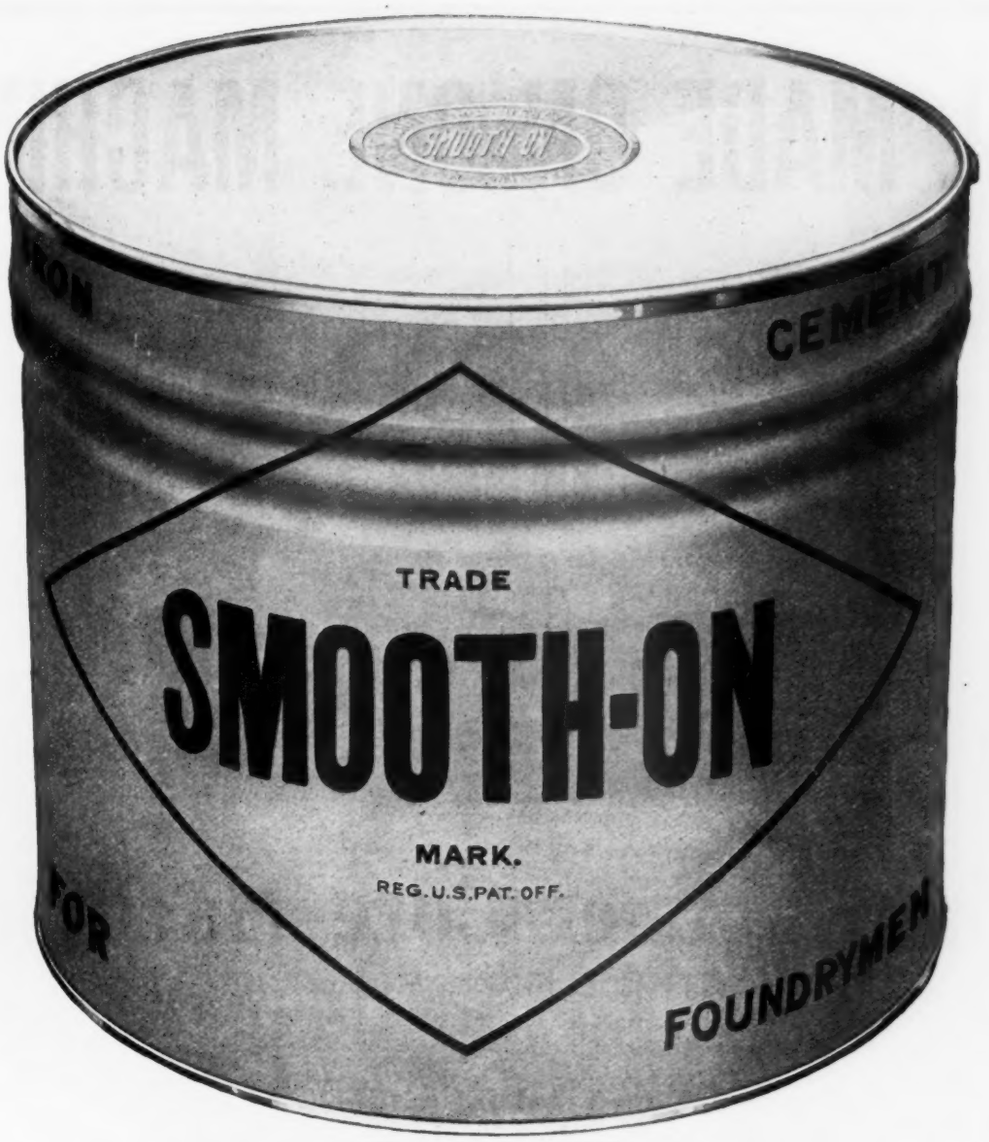
5* Our flask being made from steel, breakage is never experienced. In breakage alone the flask will soon pay for itself and with anything like reasonable care it will last a life time.

Many of the largest manufacturers are sending us repeat orders every day, **saving as well as making money,** why not you?

**We absolutely guarantee this flask to do every thing that we claim. But the way for you to find out is to order one to-day and make a comparison in your own foundry.**

# Macphail Flask & Machine Company

**290-5 Caxton Bldg., 334 Dearborn St., Chicago, U. S. A.**




SMOOTH-ON CASTINGS is a chemical iron compound that will metallize in a few hours and become a part of the casting with the same color and appearance.

ACCEPT NO SUBSTITUTE which may be offered as "Just as good." There is nothing to equal the Smooth-On products for durability and efficiency. Our new illustrated instruction book is free.

**SMOOTH-ON MFG. CO.**

**Jersey City, N. J., U. S. A.**

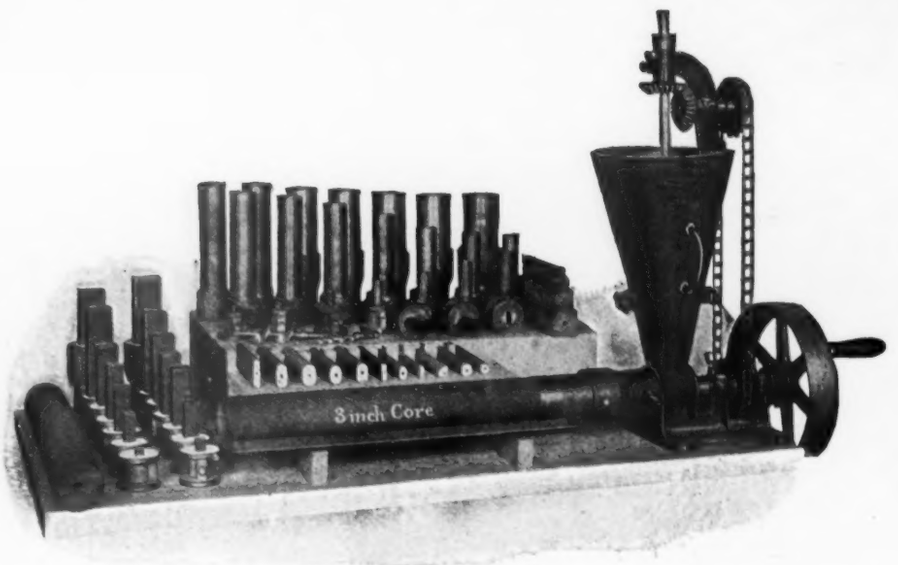
Chicago Warehouse:
61 N. Jefferson St.

San Francisco Warehouse:
94 Market St.

English Branch:
8 White St., Moorfields, London, E. C.

***If your supply house does not keep this cement, send us their name.***

# ALL MADE ON ONE MACHINE




## The Hammer Core Machine

(The Original Core Machine)

is now equipped to make

**Round Cores 1-4 inch to 3 inches.**
**Square Cores 1-4 inch to 2 inches.**
**Oval Cores up to 3 inches.**
**Irregular Shapes to 3 inches.**

This machine has a greater range than any Core Machine on the market.
We guarantee our machines to give satisfaction.
Over 1500 of these machines are now in successful operation.
Our sales of Core Machines are larger than those of all other makes combined.

*Write for our New Catalog.*

**BROWN SPECIALTY-MACHINERY CO.**

**Manufacturers**

**Corner Jackson Blvd. and Clinton St.** **CHICAGO, ILL.**

THOMAS W. PANGBORN COMPANY
NEW YORK

Exclusive Sales Agents for the Atlantic Coast States, Vermont, W. Virginia, Pennsylvania and Eastern Canada.

A short time ago a foundryman sent us the formula for his regular oil mixture.

In the proportion in which he was using it, it cost him 84 cents per ton to bind his sands.

We made some experiments according to his formula, using his mixture in the same proportion as he did, with regard to the sand, and the result was a core of a certain strength.

By a partial substitution of glutrin, we produced a core that was twice as strong as the core we made with his mixture alone, and the cost was at the rate of 62½ cents per ton of sand—a saving of 21½ cents per ton.

This is only one of many instances where we have shown how to lessen the cost, and at the same time improve the quality, of a core by the use of glutrin.

If you are interested write us.

*Carried in stock and sold by*

**George F. Crivel & Company**
BUFFALO, N. Y.

**Cutter, Wood & Stevens Co.**
BOSTON, MASS.

**Detroit Foundry Supply Co.**
DETROIT, MICH.

**Henry R. Donald Sales Co.**
MILWAUKEE, WIS.

**Hamilton Facing Mill Co.**
HAMILTON and MONTREAL, CANADA

**The J. D. Smith Foundry Supply Co.**
CLEVELAND, OHIO

**Francis Hyde & Company**
MONTREAL, CANADA

**The Hill & Griffith Co.**
CINCINNATI, OHIO, and
BIRMINGHAM, ALA.

**J. W. Jackman & Co., Ltd.**
LONDON, ENGLAND

**J. S. McCormick Company**
PITTSBURG, PA.

**Pettinos Brothers**
BETHLEHEM and
PHILADELPHIA, PENNA.

**T. P. Kelly & Co.**
NEW YORK, N. Y.

**M. W. Warren Coke Co.**
ST. LOUIS, MO.

ROBESON PROCESS COMPANY

Au Sable Forks, New York

and

39 Cortlandt St., New York, N. Y.

# Castings Pass Inspection

No matter how rigid the scrutiny of the inspector, a defective casting made perfect by the use of

## Shelton Metallic Filler

is sure to pass. The reason is plain:

The casting really is as good, as strong, as perfect in appearance as though a sand hole or blow hole never existed.

Beware of imitations that will waste your time and your profits.

Fifteen years of proven success makes Shelton Metallic Filler the best for your use.

*A sample can free.*

**Shelton Metallic Filler Company**

**DERBY, CONN.**

1853 1908

# ROOTS BLOWERS

Positive Pressure

## For Foundries

**DOES NOT THIS SOUND ABOUT AS GOOD AS IT COULD BE?**

St. Paul, Minn., April 27, 1908.

P. H. & F. M. Roots,
Connersville, Ind.

Gentlemen:

We have two of your Blowers, one for six years and the other for four and one-half years, and they certainly have given satisfaction and good service for three timee the price paid for them, and will last, according to our estimation, a life time, and we wish to congratulate you on your product. You certainly produce the best I ever saw or used.

Yours very truly,

Hickory Gas Mantle Mfg. Co.
H. Barna, Mgr.

This is a letter, voluntarily written, dated April 27th.

**P. H. & F. M. ROOTS CO.**
Home Office
**CONNERSVILLE, INDIANA**

CHICAGO OFFICE
1947 Marquette Bldg.

NEW YORK OFFICE
120-122 Liberty Street

# ROOTS'

# POSITIVE BLOWER

**P. H. & F. M. ROOTS CO.**

Home Office

**CONNERSVILLE, INDIANA**

CHICAGO OFFICE
1547 Marquette Bldg.

NEW YORK OFFICE
120-122 Liberty Street

*Send for pocket edition of Engineers Practical Reference Book.*

## AN AMBITIOUS FOUNDRYMAN

not wholly contented with the making of good castings alone, but desiring to transform them into things of beauty, sometimes develops a polishing and plating plant and thus the two go hand in hand.

To convey the idea that I furnish everything for the founder, the polisher and the plater, I exhibited at the Toronto Convention, a pretty general line. When a youthful genius at school makes a drawing, it is sometimes necessary to add an explanatory line underneath; for instance, "This is a cow",—hence my explanation.

In the foreground of this picture are sundry bottles filled with foundry facings which, when properly used, will give the smooth face so much desired to the most incorrigible castings. Just to keep up the reputation which the "bottle" has earned, there is one which contains Cyanide of Potassium, another Blue Vitriol, and others the necessary compounds and chemicals to produce the looking-glass lustre so much admired on automobile and stove trimmings.

The constellation just above them in the background is made of Spanish Felt Wheels, Canvas Wheels, with now and then a Bull Neck thrown in to add strength to beauty.

The scene changes as we move along and, while the Stevens' elephant looks a little startling, he remained harmless, high and dry, and perfectly decorous during the entire convention.

We find platers brushes, wire wheel brushes, emery wheels, shovels, riddles and other foundry supplies making up the rest of the scenery, together with all the necessary working tools for beginning at the cupola or back door of the foundry and continuing the performance to the shipping door of the finishing department from which comes the completed product.

The success of this display was due largely to the combined efforts of the two gentlemen whose genial looks enliven the scene. Mr. Alfred T. Wagner is in the foreground. Mr. Wm. M. Wilson is resting his feet on a barrel of his core blacking to relieve the table which is supporting the balance of his weight, and Mr. James F. Hughes, retired behind a barrel of plumbago to fix his smile just as the X Ray machine slipped a cog.

The moral of all this is concentration. Concentrate the purchase of your supplies for your foundry, your polishing and your plating department with me and I will make good. I will give you good service and save you money.

# FREDERIC B. STEVENS

**DETROIT, MICH.**

**Facing Mills,**
**Corner Isabella Ave. and M. C. R. R.**

**Offices and warehouse,**
**Corner Larned and Third Sts.**

**Export warehouse.**
**Windsor, Ont.**

**Address all letters to "Detroit, Mich."**

See page 95

A Revelation in Brass Foundry Methods.

# BASSITE

**A NEW PRODUCT THAT IS A PERFECT SUBSTITUTE FOR TIN IN BRASS CASTINGS.**

Some reasons why every Brass Foundryman should use Bassite:

## BASSITE

I. Will save from 40 to 45 % on your tin bill.

II. Will save from 10 to 30 % in finishing your castings.

III. Will practically eliminate porosity in your castings.

IV. Makes a much denser and tougher casting than tin, and is practically non-crystallizable.

## CASTINGS

I. Containing Bassite can be finished at from 65 to 80 % the cost of castings containing tin, because they will take the tool freely, cutting very easily.

II. Containing Bassite will take a much finer polish than any other brass casting.

**This product is especially adapted to Steam Goods, Machinery and Automobile Brass Castings.**

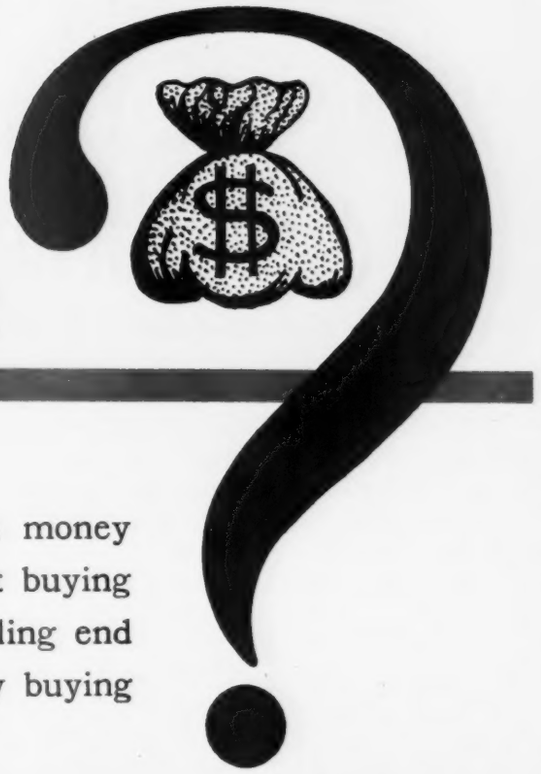
Let us give you proof of the above assertions, and ship you a trial order of 100 pounds.

*Tell us your Foundry troubles.*

## Bassite Mining & Smelting Co.

**Commercial Tribune Building,**
**CINCINNATI, - - OHIO**

# —Ever Buy Profit



EVER stop to think there is as much money made in your foundry trade by right buying as in saving in other ways, or at the selling end of your business? You can buy profit by buying RIGHT. When you purchase

## SHANAFELT FOUNDRY AND PATTERN SHOP SUPPLIES

you receive the RIGHT service on the RIGHT goods at the RIGHT price from the largest manufacturer of foundry supplies in America. We stand behind every sale—we couldn't afford to guarantee poor stuff any more than you could.

---

*Send us your next order—or drop a card today for Shanafelt's latest catalog to have as a "tickler".*

---

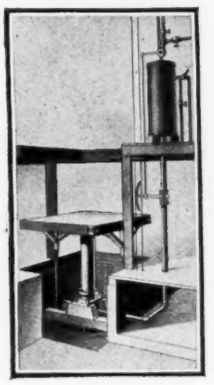
**CHAPLETS, Steel Cement, Leather and Wood Fillet, Pattern Letters and Figures, Brass and Hardwood Dowels, Pinch Dogs, Rapping Plates, Corrugated Steel Fasteners, Fillet Tools, Etc.**

**The SHANAFELT MFG. COMPANY**

Successor to The Canton Fillet Co.

**100 Jackson Street -:- -:- Canton, Ohio**

# "Ridgway, Your Slogan is a Fortune."



DIRECT ACTING

Indeed! And what does it mean to you?

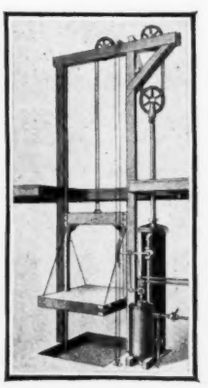
"HOOK 'ER TO THE BILER" means a surcease of elevator troubles to thousands of tired men, but what does it mean to a poor old elevator bedeviled manager like you?

Nobody cares what nice things you say about the Republican party if you never vote the Republican ticket.

And who cares what you say about Ridgway's Slogan, "Hook 'er to the Biler," if you go and hook 'er to an old balky pump, rotten belt, or uncertain dynamo, and keep right on "votin' for the elevator curse?"

Some of you engineers and managers are making nice things out of yourselves. The Powers That Be are not fools. They will waken up some day and want to know why you never got Steam-Hydraulic elevators for their plants, like all the other first-class plants are doing. What will you tell them?

You will not dare to tell them the truth, to-wit: "I was not up to date nor my business." The best engineers all over the land now



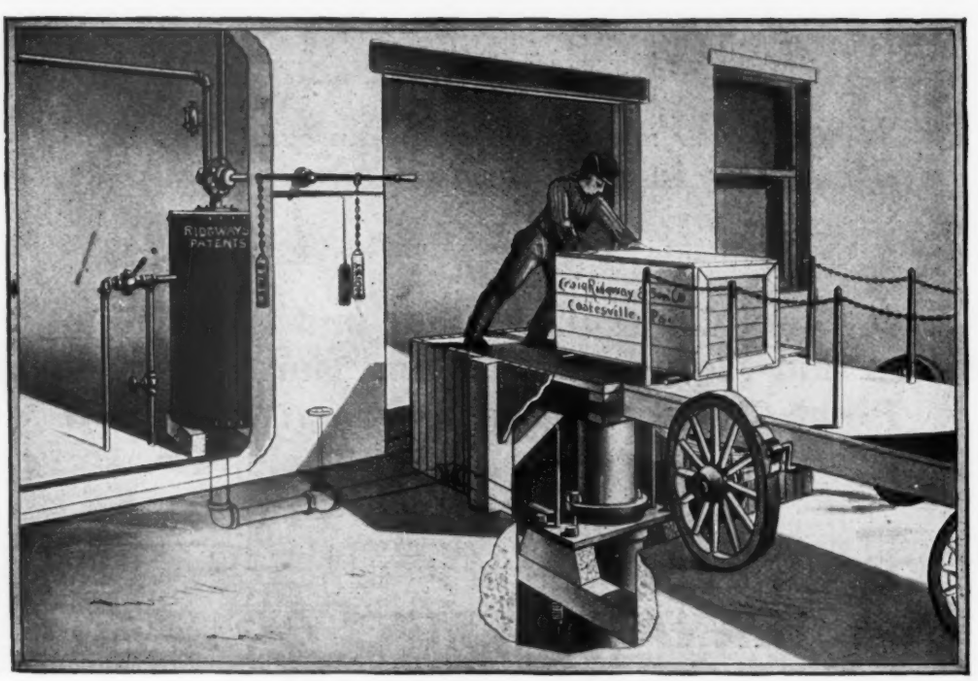
DOUBLE GEARED

## HOOK 'ER TO THE BILER

## CRAIG RIDGWAY & SON COMPANY

**Coatesville, Pa.**

**London Office: 13-15 Wilson St., Finsbury, E. C.**

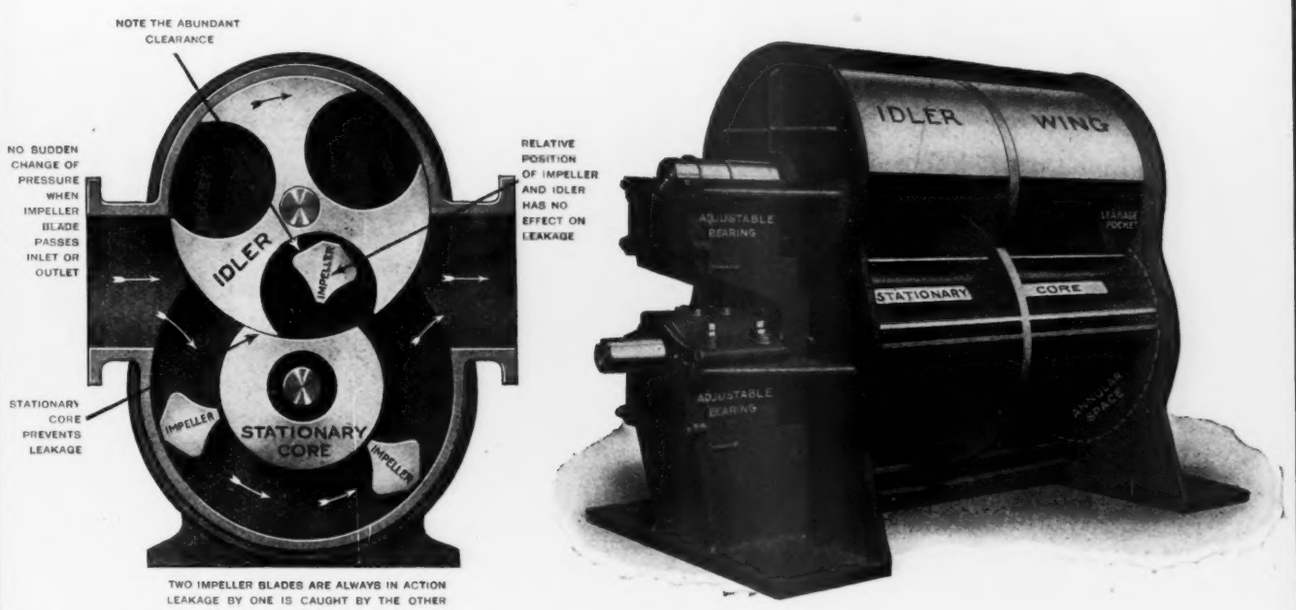



**Greatest Modern Money Saver**

# The Only Positive Blower Having Rotors Absolutely Independent of Each Other is

# The Sturtevant

Impeller and Idler Absolutely Independent of Each Other




The Sturtevant—the Only Single Impeller Blower Without Internal Contact

No Power Transmitted by Gears.
No Pulsation of Pressure.
No Constant Attention.
No Loss in Efficiency.

**A Blower to Purchase, Install and Forget.**

## B.F.STURTEVANT CO., Boston, Mass.

**General Office and Works, Hyde Park, Mass.**

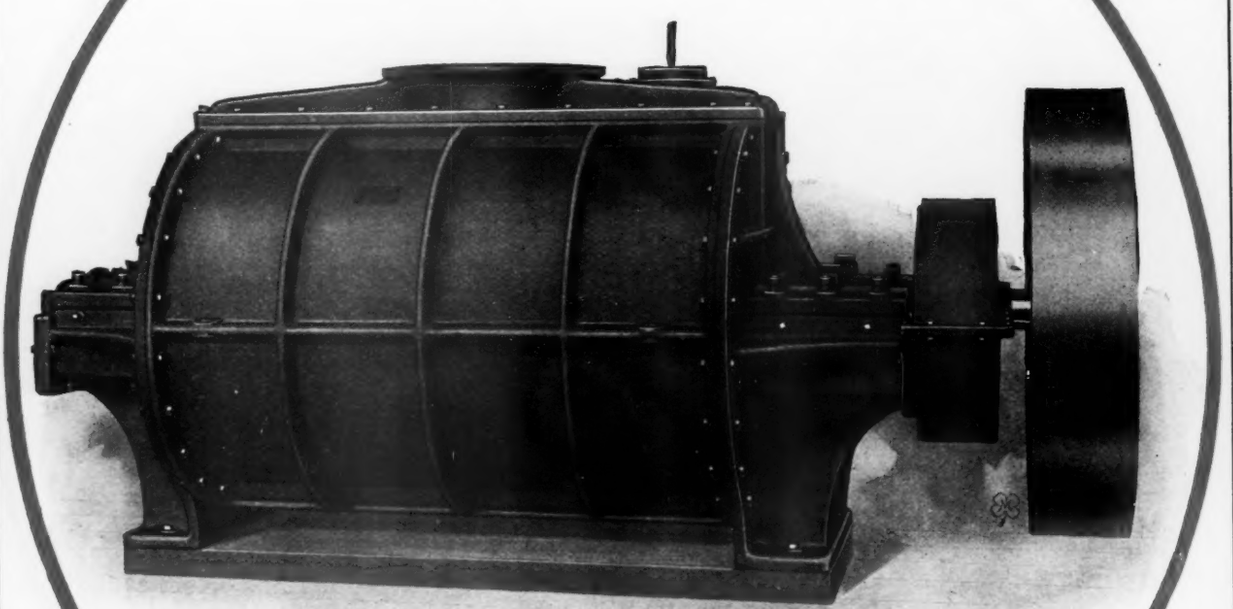
NEW YORK PHILADELPHIA CHICAGO CINCINNATI LONDON

**Designers and Builders of Heating, Ventilating, Drying and Mechanical Draft Apparatus; Fan Blowers and Exhausters, Rotary Blowers and Exhausters; Steam Engines, Electric Motors and Generating Sets; Pneumatic Separators; Fuel Economizers, Forges, Exhaust Heads, Steam Traps, Steam Turbines, etc.**

662

# THE CONNERSVILLE ROTARY BLOWERS

## FOR FOUNDRIES



## ARE NOT EXPERIMENTS

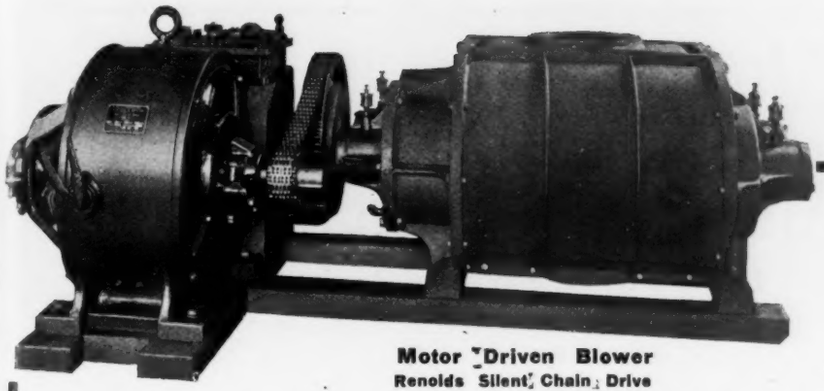
*Ask us questions*

**THE CONNERSVILLE BLOWER CO.**

**Connersville, Ind., U.S.A.**

**Eastern Office**

**50 Church St. - New York City**



Motor Driven Blower
Renolds Silent Chain Drive

They always work well. That is why thousands are in daily use.

## "THE OLD RELIABLE"

# GREEN ROTARY POSITIVE PRESSURE BLOWER

1854

1908

Belt Driven Blower

For service in foundries where compact machinery of the highest possible efficiency, durability and economy are necessary. Belt, Chain, Gear or Engine drives.

**Wilbraham-Green Blower Co.**

**2518 Frankford Ave., PHILADELPHIA.**

Canadian Agents
**Dominion Foundry Supply Co., Ltd.**
MONTREAL TORONTO, ONT.

Motor Gear Driven Blower

We desire the

Thought, Attention, Investigation and Judgment of

"Foundrymen of the Universe"

respecting our modern Crucible Furnace as to "economy", "quick handling and melting" of metals in equitable time to avoid "excessive oxidation" it appeals to the progressive

***"Steel Foundry"*** for reducing Ferro-Manganese, Vanadium, Silicon and Nickel.

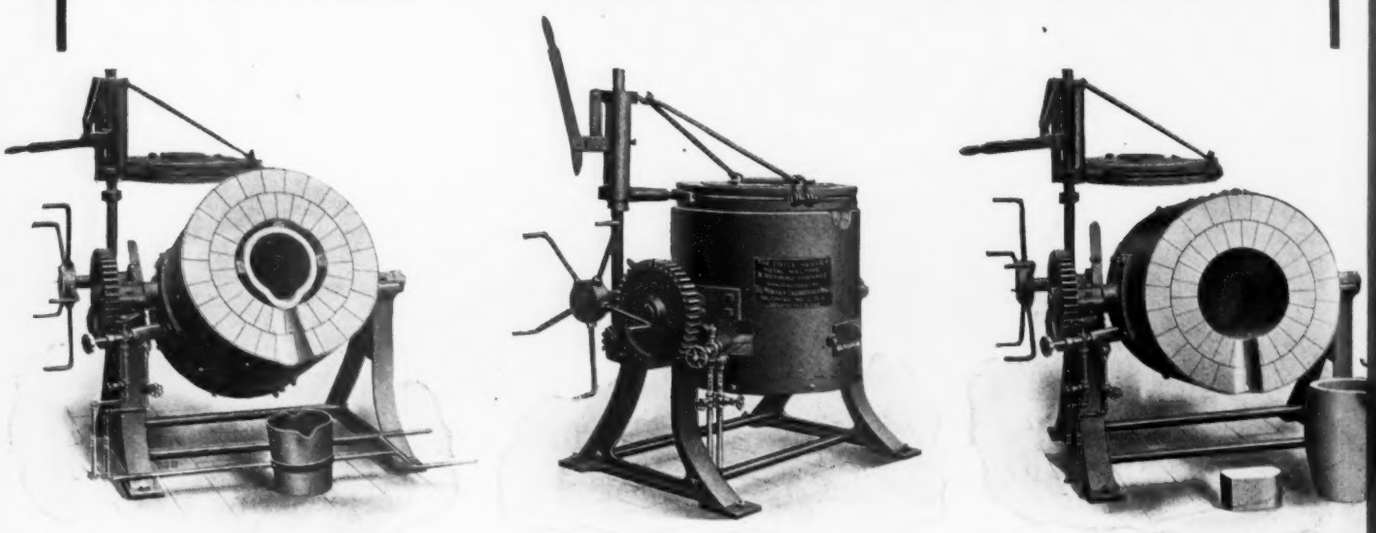
***"Brass Foundry"*** for Brass, Copper, Aluminum, Nickel, "Phosph. Tin & Copper" and Sundry Metals

***"Mining Industry"*** for Cyanides, Cobalt and Silver Ores, etc . . . .

operated with "Fuel Oil or Gas and Air" in lieu of "Coal or Coke"

**"Steele-Harvey"**

**CRUCIBLE TILTING MELTING FURNACE**



POURING POSITION MELTING POSITION SUNDRY PARTS

One furnace equal to 3 old style. **50% ECONOMY.**

Shipped subject to test. Capacities to 1600 lbs. Quick shipments.

We manufacture also **Lifting Out Crucible Furnaces, Rotary Blowers, Oil and Gas Burners** for skin drying and Core Ovens and 100 various furnaces.

***Our "1908" Catalogue mailed if interested.***

**The Monarch Engineering & Mfg. Company**

**7 West Lombard Street, BALTIMORE, MD., U. S. A.**

**Works: Curtis Bay, Md.**

# Paxson's Quality

Published monthly in the interests of the Foundry industry by J. W. Paxson Co.

Third Issue | PHILADELPHIA, AUGUST, 1908 | Four Pages


## Paxson's Quality

**YES, "Paxson's Quality" came to stay;** the fact of our being in business over fifty years verifies this statement. Quality talks, and if your Foundryman asks for Paxson's Cupola or any other goods of Paxson's Quality, send us the order, by experience he knows the best. Never mind what some other salesman says about his being "just as good"—gold bricks are sold every day, it's the same old story, your Foundryman knows what will produce results, it's Quality, Sir! Paxson's Quality.

Our exhibition rooms are always open and there you can see in operation Sand Sifting Machines, Core Ovens, the famous Paxson-Warren Sand Blast, Glenwood Rockover Molding Machine, etc., etc., and a representative to show you the mechanism, and if you want information, ask him—that's his business—it's no trouble to show goods.

We have thousands of Bulletins, Catalogs, Pamphlets, etc., on every conceivable Foundry Requisite, they are yours for the asking.

Don't lose hope because you are not getting as many orders as your competitor—but get your Supplies from us—the same as he does and things will come your way. Your customer only wants his money's worth (in the foundry business that means more than a "good" article, it means the best that can be produced) that spells "Paxson's Quality". Don't be deceived.

## Paxson's Bulletin No. 18

**Not an Ordinary Catalog,** but an extraordinary reference work. Should be on every foundryman's desk. It teems with practical information for the progressive founder. The chapter on molding sands is unusually comprehensive. All of the different grades which we mine from our own banks and ship in our own boats are described, and the uses for which they are best adapted are clearly set forth. If you are in the jobbing foundry business it is of interest for you to know which grades of sand will best answer your purposes. Our BULLETIN No. 18, gives you this information in detail, describes the character of the sands and contains other information gathered from years of experience in the sand business. The malleable founder, the brass founder and the steel founder will likewise find information in this book which will help them to solve many difficult sand problems.

This Bulletin also contains information on the use of core compounds, core and mold washes, fire brick, cupola linings, core machines, and general core room equipment. Six pages are devoted to the use of fluxes and alloys.

Bulletin No. 18 contains 44 pages.

Cost—a postal and say you saw it in *"Paxson's Quality."*

Fig. 670

PAXSON'S CUPOLA GIRL

What! You can't come this evening? Well, that is the fourth time this week that that cupola has detained you. Now, you must either get a new cupola or a new girl. Why don't you try a "Paxson Quality?" Papa has one in his Foundry and the Molders are stuck on it because they get through an hour earlier than they used to.

# Pan Grinder and Mixer

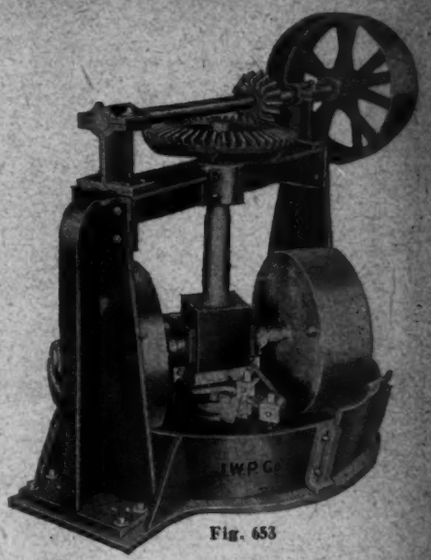


Fig. 653

DID you ever figure the cost of mixing your facing sand by hand? The services of several laborers are required and their wages within a year will more than cover the cost of a modern grinder and mixer. A machine that will pay for itself within a year is certainly a good investment.

The grinder shown in the accompanying illustration has been designed and built especially for grinding and mixing steel molding and core sand with molasses water and for grinding and mixing mulley for cast-iron water and gas pipe foundries. It will grind up old core butts, cinders, old bats, rock, ore, etc., either wet or dry. The finished product will be forced out of the door in the Pan by the scrapers. Dry material will pass thru perforated plates or grating of any mesh on the bottom of Pan.

The hard iron or steel tires and bottom plates can be renewed at small cost. These Machines are top geared, preventing gritty substances from injuring the gearing, belting, etc.

We are prepared to make prompt shipment of Machines in six sizes with Pans ranging from 5 to 9 feet in diameter and Rolls from 30 x 10″ to 50 x 15″.

See other styles and capacities either belt or motor driven in our Bulletin No. 15 on Mixing, Grinding and Separating Machinery.

J. W. Paxson Co.,
Philadelphia, Pa.

# Facing, Facing Facts

ONE ounce of "Paxson's Quality" Pure Silver Lead will adequately face a flat surface 3 ft. 8 in. long x 2 ft. 0. in. wide, and, estimating the cost to you at 4c per lb., one square foot of this surface has cost .000341 cents, or, 4c for the 117¼ sq. ft.

All Leads will not accomplish these results because they are not properly refined, or made from the best Ceylon Lead. They are frequently adulterated with cheaper products, have every appearance of being equal to the best, but they won't stand up to our tests.

*Cheap in price are* the most expensive materials you can buy. You need the most refractory substance, and as ours are higher in carbon and the finest in texture, we solicit a comparison in trial order.

Always tell us if you wish to use Plumbago on Green Sand, or as a Wet Blacking, or on both, and we will satisfy the most exacting users.

## Paxson's Shipping Facilities

JUST a word about Paxson's ⟨P⟩ freight lines. Fifty years ago the first hull of our fleet slid from the ways into the water. This modest beginning formed a nucleus of the finest equipped line of river and ocean going tugs—steam and towing barges along the Atlantic coast. It comprises three large ocean going tugs, seven steam barges, and eleven towing barges, with a combined capacity of about 7,000 gross tons.

We therefore not only manufacture and produce our own material, but can deliver the same in our own bottoms to any water point, inland or outside, along the Atlantic coast. Furthermore, our facilities for shipping by rail, by regular steamer or sailing lines are unexcelled for domestic and foreign trade. See Bulletin No. 18.

## Second-Hand Equipment

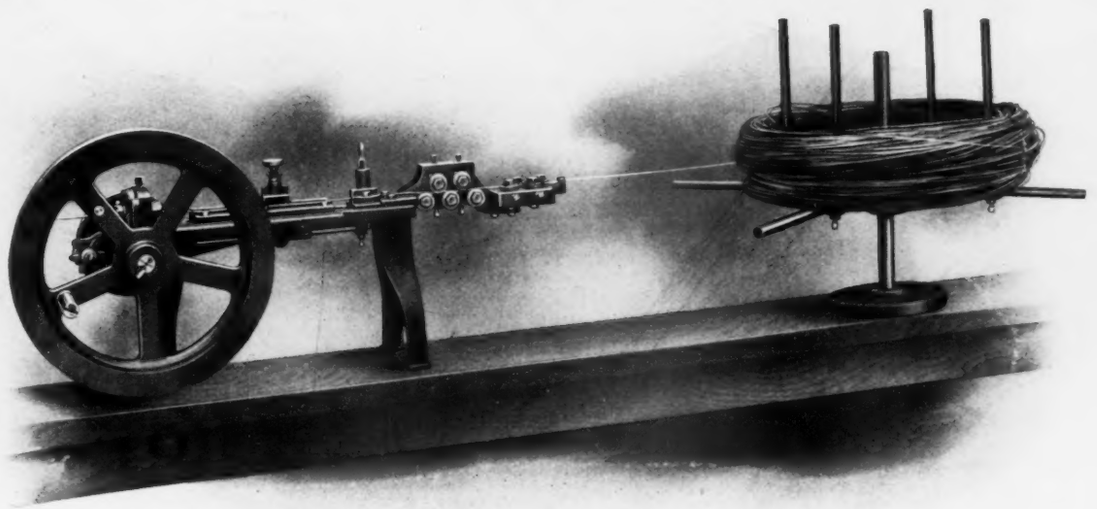
WE OFFER for your consideration some rare bargains in second-hand Foundry Equipment. All have been put in first-class condition by our own Shops, and will be sold at about one-half the cost of new.

### FOR SALE

1—P. & M. 7′ Pan Grinder.
1—Tripod Hanna Sifter.
3—McKenna Molding Machines and Flasks.
27—Brass foundry furnaces, assorted.
1—Monarch ashes grinder.
1—Sawyer magnetic separator.
1—Nos. ½ and 6 Roots blowers.
1—Nos. 2 and 5 Baker blowers.
1—Each Nos. 5, 6 a i 9 Sturtevant.
1—Seller's centrifugal sand mixer.
1—1200 and 400-lb. capacity Sulky ladles.
1—54″ Crandall cupola.
15—Barnett Flasks 16 x 16 x 3″ cope and 2″ drag.
1—30 x 52″ steel shell exhaust rumbler.
1—36″ x 48″ C. I. rumbler.
1—Each 7 and 8-ft. pan grinders.
1—Sprue cutter, belt power.
1—13 ton Geared Ladle.
2—54-in. Paxson-Colliau Cupolas.
1—Gould & Eberhardt double end sifter.
1—Each 125 and 250 h. p. Corliss engines.

J. W. Paxson Co., Philadelphia, Pa.

# Core Wire Cutting Machine



### ADVANTAGES

No boys cutting core wires.

Wires straight and clean, ready for core.

All wires same length.

Cutting off knife run by power does not bend ends or buckle wire.

Work done automatically and rapidly.

It is economical in space, saves time of high priced core maker, cuts out the boys, saves wire, and is always on the job.

Foundrymen who have them in use say, "Why didn't I think of this myself."

It's the machine with all its reliability and stability against the frailties and uncertainty of cheap help.

THIS MACHINE will cut and straighten accurately, rapidly and cleanly the small core wires which in all foundries have heretofore proven an expensive operation. One boy, with this machine, can in half an hour straighten and accurately cut as much wire as two boys could do in a day the old way. The operation of our No. 7 machine means economy and satisfaction in your core room.

## What The Machine Does

A coil of wire is placed on the spindle. The gauge on the side of the machine is set to cut wire at desired length. The core maker gives the wheel a few turns, and core wires straight, clean cut at both ends and all of equal length are made at the rate of 100 per minute. The straightening, measuring and cutting are all automatically done without a hitch.

Is its value not apparent to you?

***Write for further information.***

## The Gregg Manufacturing Co.

**1318 West 4th St.**
**CLEVELAND, O.**

REPRESENTATIVES: Thomas W. Pangborn Co., Eastern Sales Agents, 90 West St., New York City. The J. D. Smith Foundry Supply Co., Cleveland, O. The Hill & Griffith Co., Cincinnati, O., Birmingham, Ala. Detroit Foundry Supply Co., Detroit, Mich., Windsor, Ont., Can. Berger & Carter Co., San Francisco, Calif., Seattle, Wash.

ROSS-TACONY CRUCIBLE CO.
300
TACONY
PHILADELPHIA, PA.
THIS BRAND STANDS FOR QUALITY

# This Trade Mark stands for the acme of crucible uniformity

If you are not satisfied with the results you are receiving, the "Taylor" Crucibles will bear investigation. They are the result of years of most careful study.

*A trial will convince you.*

## Robert J. Taylor, Incorporated

**1900 to 1916 Callowhill St.**

**PHILADELPHIA, PA.**

We concentrate our energies--we make crucibles only. We make them where they are used--in the midst of the greatest steel and brass industries of the United States. We know your needs.

Send us an order.

McCullough-Dalzell Crucible Co.

Pittsburgh
Pa.

# Dixon Crucibles

## The kind that last

After eighty years of experience in the manufacture of crucibles, we believe that we know how to make them--and our customers agree with us. But still we go on studying the subject and making improvement wherever such improvement is possible.

We make crucibles adapted to the melting of the different metals and, where there is not positive misuse, find that Dixon Crucibles give long service.

A trial order will prove all this---in the meantime get our handsome new crucible book No. 51-A on the care and use of crucibles.

## Joseph Dixon Crucible Co.

Jersey City, N. J.

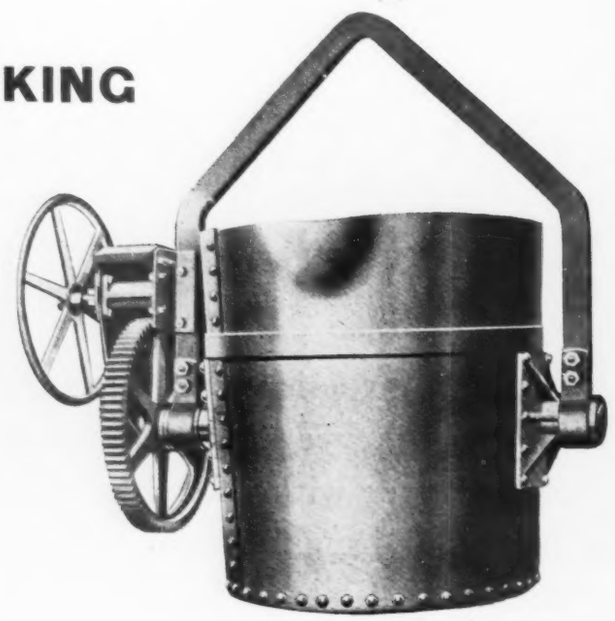
# CALUMET FOUNDRY EQUIPMENT

## LADLES

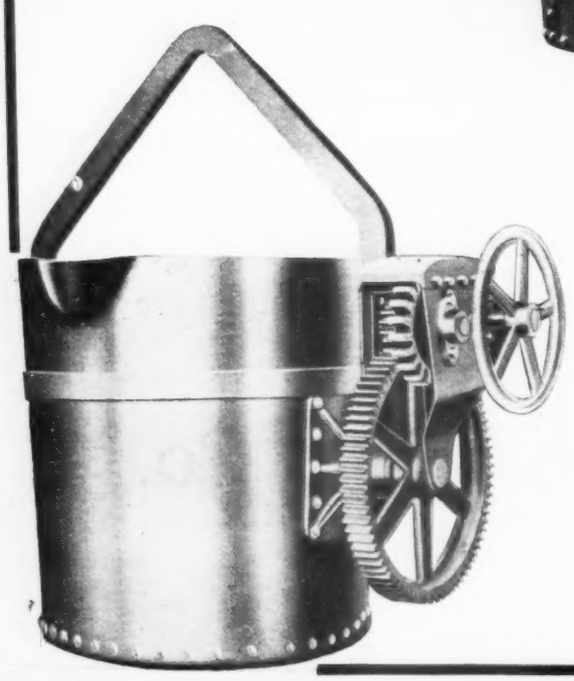
The Gearing is mounted in a frame of **Greater Stiffness, Simplicity** and **Accessibility** than any yet designed for Ladle Gearing.

The gearing is all self-contained, and may be detached by the removal of three bolts through the bail.

**SELF LOCKING SPUR GEARS AND SAFETY DOG**



**PRESSED STEEL BULL LADLES WITH PIPE SHANKS**



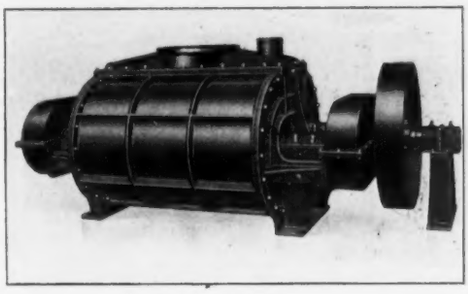
CALUMET CUPOLA
CALUMET AIR HOIST
CALUMET TUMBLERS

*Send for Catalogs.*

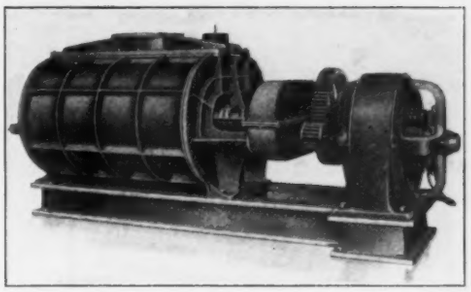
**CALUMET ENGINEERING WORKS**

**HARVEY : : : ILL.**

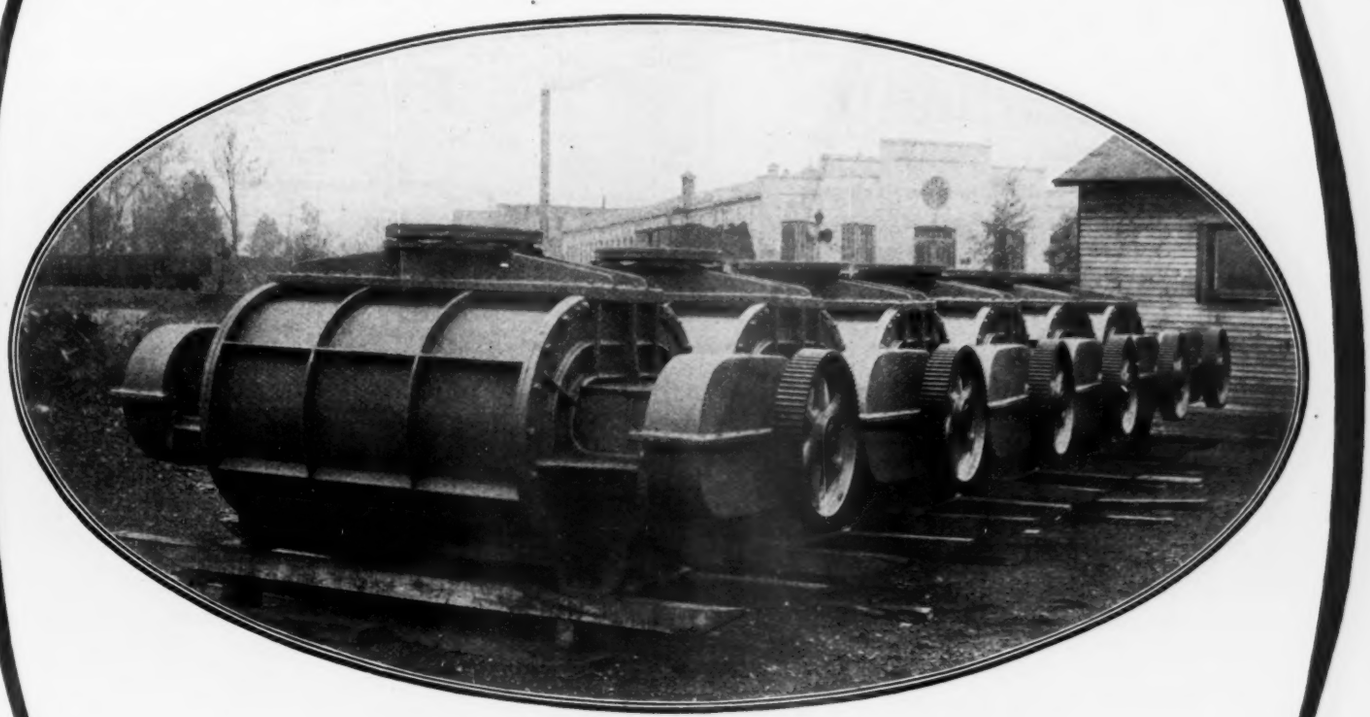
# USE PIQUA



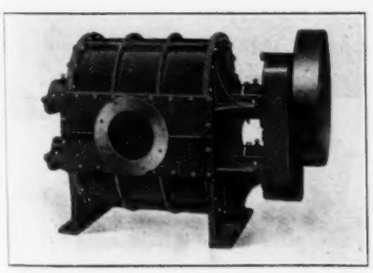
POSITIVE
PRESSURE



DUPLICATE ORDERS ARE THE BEST EVIDENCE THAT PIQUA BLOWERS ARE SATISFACTORY.



Let us send you a list of purchasers having placed more than one order with us. It will be more convincing than any statements we might make. May we have the pleasure?

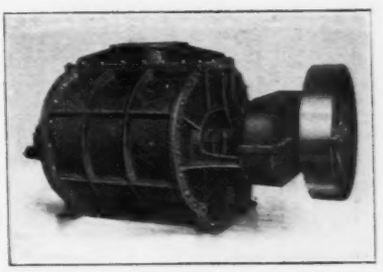


**PIQUA BLOWER CO.**

General Office and Works
PIQUA, OHIO

CHICAGO
707 First National Bank Bldg.,
C. Van Deventer, Rep.

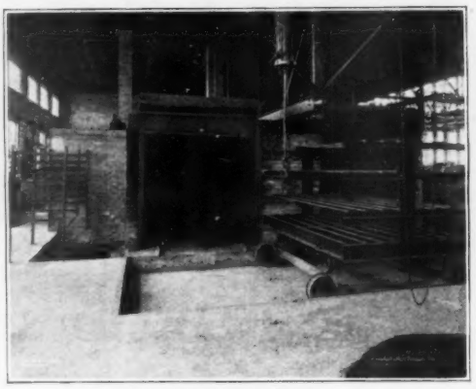
NEW YORK
Bennett Bldg. Nassau & Fulton Sts.
J. Gilmour, Rep.



# BLOWERS

**The Whiting Cupola**

**Catalog No. 50.**



Core Oven Installation, showing Core Oven Truck on Transfer Car,

Manufacturers' Foundry Co., Milwaukee, Wis.

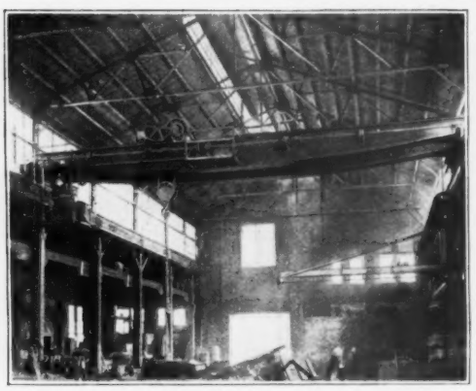
**Whiting Improved Air Hoists**

**Catalog No. 51.**

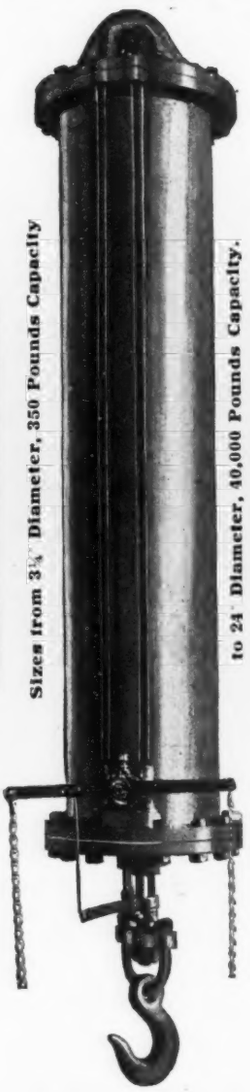
Complete Equipment Furnished for this Foundry

# Complete Foundry Plants

# Cranes for Every Service



25 Ton 3-Motor Electric Traveling Crane, Foundry of Ferguson & Lange, Chicago, Ill.



Sizes from 3¼" Diameter, 350 Pounds Capacity to 24" Diameter, 40,000 Pounds Capacity.

10-Ton Floor Pendent Traveler. Sheffield Foundry Co., Chicago, Ill.

## Whiting Electric Travelers

**The Greatest Time and Labor Saver**

Scientific Design
First-class Construction
Improved Brakes
Movements under perfect control, for drawing patterns, setting cores, lifting copes, etc.

## Hand Power, Floor Pendent Traveling Crane

A reliable foundry crane, always ready for use, regardless of operation of a power plant. Made in all capacities. Construction permits of attachment of electric or air motors at little expense.

**Whiting Foundry Ladles**

**Catalog No. 47**

**WHITING FOUNDRY EQUIPMENT COMPANY**

Manufacturers
Engineers
Designers

Harvey, Ill.
(Chicago Suburb)

**Whiting Cranes**

**Catalog No. 45**

See our Tumbler advt. page 93

THE FOUNDRY

Vol. 32, No. 6 CLEVELAND, OHIO, AUGUST, 1908 Whole No. 192

# PRODUCTION OF MALLEABLE CASTINGS-VI

## Work of the Pattern Shop, One of the Most Important Departments of the Malleable Foundry

BY RICHARD MOLDENKE

ONE of the most important departments of the malleable works is the pattern shop. When compared with the ordinary gray iron foundry, the product of the malleable shop is very light and the number of castings made from practically every pattern enormous. Hence every refinement in pattern-making for light castings is found in this branch of the foundry industry. A modern pattern shop for this purpose would therefore be equipped with the usual wood working machines, as well as individual wood trimmers and other labor saving devices for each bench; and also have every facility for metal patternmaking as part of the installation. Thus a vertical universal milling machine will be found indispensable where accurate and quick work is to be turned out. The pattern shop in fact becomes a foundry for white metal castings, a tool room, machine shop and model works all combined. It naturally takes a high order of shop executive to conduct such a department successfully, and hence we find many a superintendent a graduate from the pattern department of a malleable works.

When a blue print or pattern comes in, a careful study is made to see just how much it will pay to spend upon the pattern end in order to turn out the job in the cheapest way. Every shop has its own experience in this regard, and concerns that send

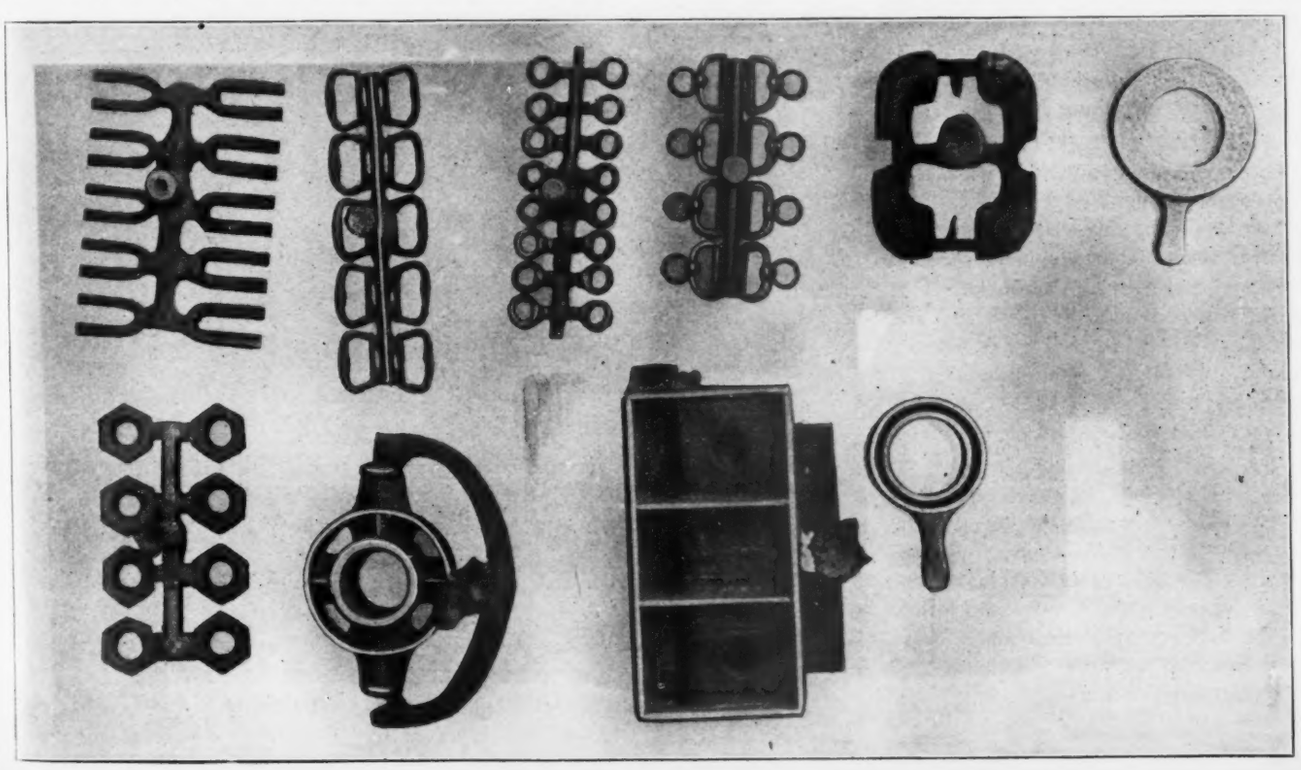


FIG. 1—MISCELLANEOUS MALLEABLE CASTINGS SHOWING METHODS OF GATING

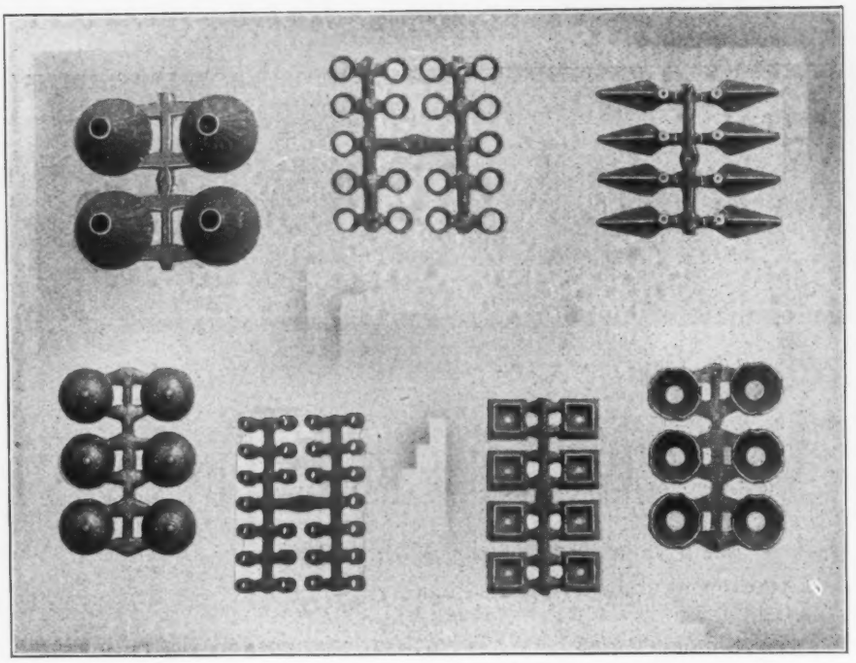


FIG. 2—METAL PATTERNS FOR CHANDELIER TRIMMINGS

out patterns are sometimes puzzled to learn that their patterns are gated wrong; that it will cost so and so much to set things straight, or that unless permitted to change the pattern or the grouping of the individual pieces, the price quoted would be advanced.

### Ordering Castings.

Large consumers therefore have adopted the method of ordering their castings simply by blue print, the works to make and keep the pattern. This, while a little hard on the shop taking the order, is the most satisfactory in the long run, as it puts the whole matter strictly up to the management to make good. There is a good deal of give and take in this, and the result is sometimes a loss on the order.

For example, the writer remembers having had a contract from a great railway system by the terms of which blue prints would be sent in, and castings ordered at a certain price a pound, regardless of the number of castings, works to make all patterns. A very intricate job was made under this arrangement, the pattern work on which amounted to many hundred hours, but only seven castings weighing some 100 pounds apiece were required. The price paid was just short of 3 cents a pound. On the other hand, very many times under that same contract, an order called for 20,000 castings, some 15 pounds in weight, without change of pattern. Another very good arrangement is sometimes entered into, and that is keeping stock for a customer until called for, under guarantee of taking over up to a given number of these castings in case of change in pattern. This enables the founder to fill up a day for the molder, or to put the job on in case of a dearth of orders, storing the finished castings in the warehouse. The consumer, on the other hand, if requiring quick deliveries for some rush job finds his castings ready in part and is thus greatly accommodated.

It will be seen that this method of doing business necessitates a rather large pattern shop, and as practically all of the large works cater to railroads and other industrial enterprises which are continually improving their output, it oftentimes happens that some 35 patternmakers are required to keep 300 molders at work.

### Specialty Pattern Work.

On the other hand, the makers of fittings, saddlery or other hardware, in which standard patterns can be kept, have gotten things so nicely balanced in their pattern systems, that they know to a dot just how many pieces can safely go on a card or plate; how the runners must be placed, their size, and how attached to the individual patterns. This work is now all metal, and the pattern store room of a modern large malleable works making a line of very small castings is very interesting and entails a heavy investment.

When developing a new article, say a journal box, rail joint, wagon skein, or what not, the patternmaker must practically 'live in the foundry. As the trial castings are made, he must measure them up with the pattern, make little changes here and there, try the matter out again, both before and after anneal, with iron from different parts of the heat, and thus bring out new points calculated to make the molding end easier, the dif-

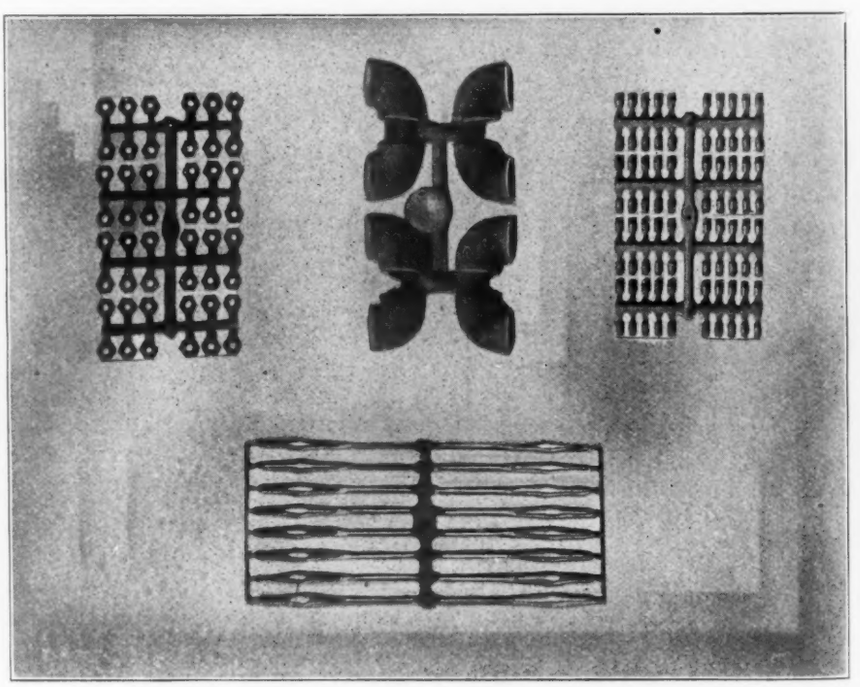


FIG. 3—MALLEABLE CASTINGS SHOWING METHODS OF GATING

ficulties from shrinkage less, and swing the job so that it can be carried on without difficulty. One therefore seldom finds the friction between molder and patternmaker in the malleable shop, so usual in the gray iron foundry, as the two departments are peculiarly inter-dependent. It should be the rule never to start an order for quantity on the floor until the pattern has been tried out, the hard castings broken up for evidences of shrinkage, the necessary corrections made, and every one interested satisfied that it is safe to go ahead.

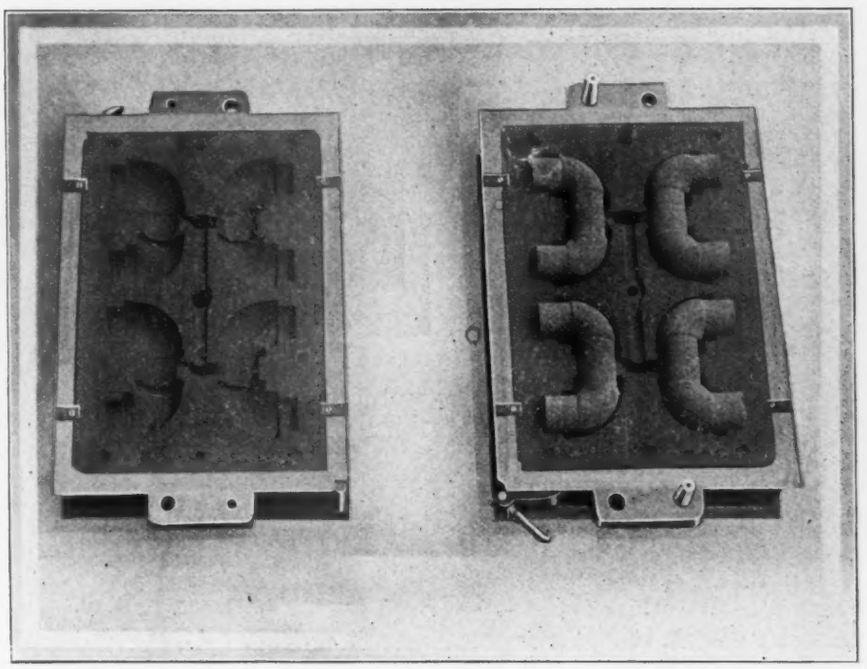


FIG. 4—MOLD CONTAINING EIGHT ¾-INCH STREET ELBOWS

**Contraction and Shrinkage.**

The above naturally results from the problem of the contraction of malleable cast iron. Contraction and shrinkage are two separate and well understood features in "malleable." Whereas shrinkage is erroneously applied to the shortening of a casting in cooling in the gray iron foundry, in the malleable, "shrinkage" is understood to mean the tearing apart of the particles of iron in the interior of a larger section, close to a small one, leaving a spongy mass, naturally weak, which is highly dangerous to the life of the casting. Contraction, on the other hand is simply the reduction in size incident to the cooling of a casting from the point of set to ordinary temperatures.

Now in the case of malleable this contraction in the hard casting is roughly ¼-inch to the foot, or double that of gray iron. In the anneal one-half of this is recovered, and hence the net result is the same as in ordinary foundry pattern practice. It will be seen, however, that this big contraction causes the tearing away of the iron particles above mentioned wherever a heavy part remains liquid just a little longer than the adjacent light part already set. The result must be a void, unless liquid iron can be fed in, or else the heavy portions chilled and made to set while the lighter parts can still pass liquid metal. Hence the use of chills, so prevalent in the malleable foundry. These mean expense, leave an uncomfortable feeling that the shrinkage was forced to some other part of the casting, are in every way undesirable, but remain a necessary evil. Feeders can also be used on occasion to advantage, but mean an increase in the already high percentage of wasters, and hence are resorted to only when necessary.

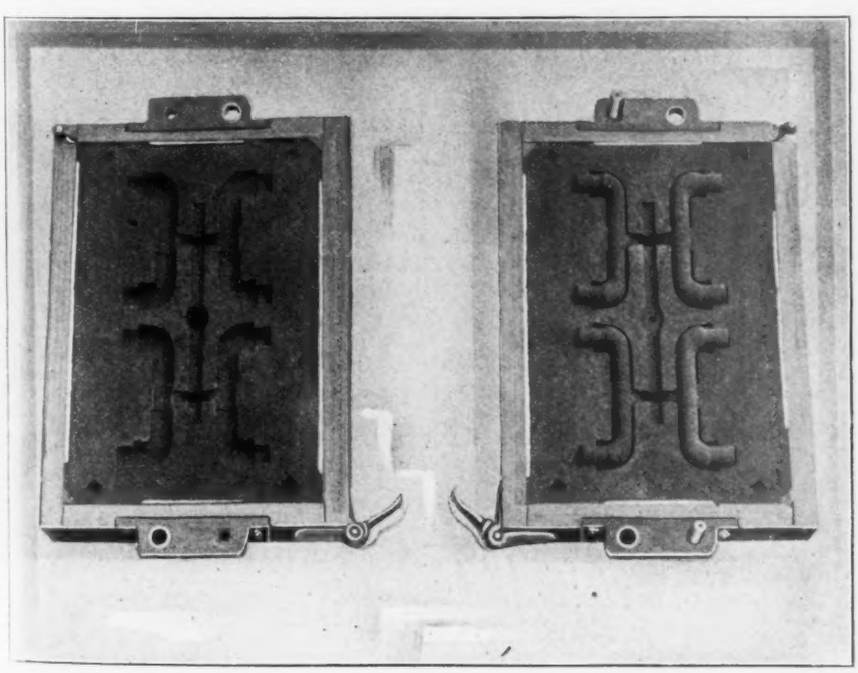


FIG. 5—MOLD CONTAINING EIGHT SMALL STREET ELBOWS

**Use of Chills in Malleable Practice.**

As a matter of fact, the chill is a very serviceable article, even if expensive. At one time a certain knuckle (by the way sold as steel), the section of which was three or four times as great as malleable could be successfully cast in the sand, was extensively used and gave very good results. Breaking it revealed the black heart of malleable. Observing the surface closely, quickly explained the reason for its quality. Chill upon chill could be traced by the contours left. Here was an example of what might be called a sandless casting at least in part. Probably it cost more than the steel casting, and hence finally disappeared. The chilling, however, accomplished a result that could not have been obtained in any other way, as it was necessary to have the casting practically white in the hard in order to anneal at all. About the ethics of selling this, as well as many other malleable articles, for steel, quite a chapter could be written.

**Contraction.**

The contraction of the iron used in malleable work has been mentioned as practically ¼-inch to the foot, with a return of ⅛-inch in anneal. Hence

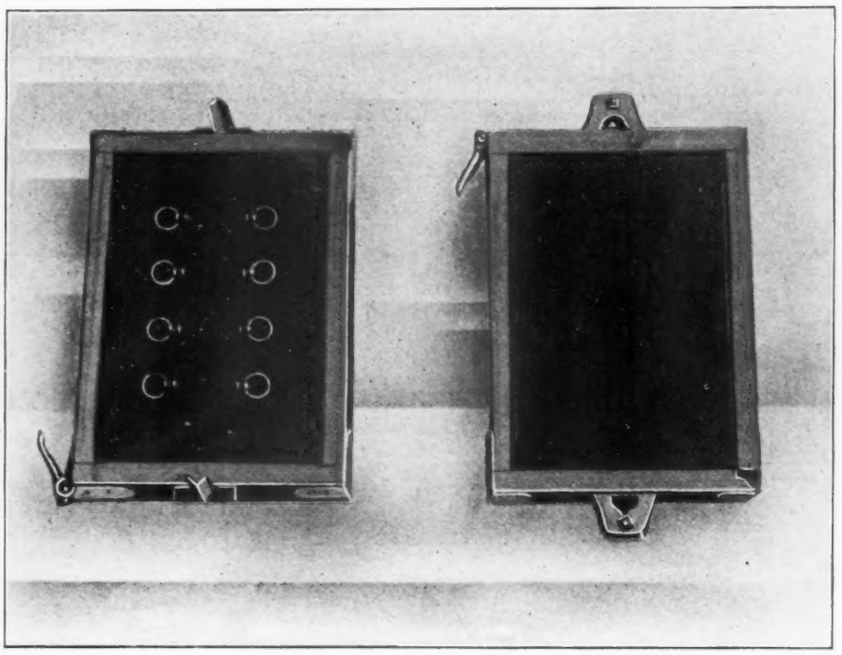


FIG. 6—MOLD CONTAINING EIGHT RAZOR STRAP SWIVELS

the shrink rule of the regular foundry pattern shop is used. Now this ¼-inch contraction will vary from 3/16 to 5/16-inch, and occasionally a little beyond even these limits. This is caused by many factors closely associated with the constitution of white iron. Thus, the lower the silicon and hence the harder the iron, the greater the contraction. Again the more sprues used, or the more steel used in the mixture, the silicon of the castings being the same, the greater the contraction. In the same heat, the first and last iron give different contractions, depending a good deal on whether the heat was "high" or "low" in the first place. Hence the importance of careful attention on the part of the pattern shop in following up work having to pass inspection, or where castings are sold by the piece, and any excess iron is a loss. The composition and method of melting the metal having its effect also on the anneal, the castings may not recover the ⅛-inch, and again repeated annealing opens up the structure to an extent quite appreciable in measuring up the finished casting. Thus the whole question is beset with difficulties, every case requiring individual treatment.

### Use of Steel Scrap.

With rather thin castings the expansion after anneal may be so great that occasionally the whole of the contraction is taken up, and the casting is as large as the pattern. This more particularly with the higher ranges of silicon in the iron. Hence, as previously stated, particular attention should be given each case.

Nor is the subject closed here. Of late there has developed a tendency to add large quantities of steel scrap to malleable mixtures. This is copied from the steel additions in gray iron, where occasionally as high as 40 per cent goes into the cupola. In the case of small castings, the bad effect of too much steel is perhaps not so noticeable as in the long or complicated ones, but not only will there be annealing troubles where more than 10 per cent of steel scrap is used in a malleable mixture, but there will occur serious cracking on the part of castings in the hard, especially where strains are likely to be set up. These cracks are not always discovered in the trimming room, unless practically each casting is struck to see whether it rings true. The result is that such castings are annealed and go out into service only to cause annoyance and trouble. Thus will result difficulties from experimenting beyond safe limits, whether this be in mixture making, melting, or in annealing temperatures.

### Gating Patterns.

In gating patterns it should always be remembered that we have to deal with a metal which chills easily, and hence must be poured very rapidly. Again for the same reason the number of pieces that can be run successfully is limited, unless the gates be made too thick, which in turn means dirty iron and a larger discount. The runners should be amply large, and the sprues heavy. The idea is to get a large amount of metal right in front of the gate for the individual casting. The rest will then be up to the molder to pour properly and the melter to give iron that can be satisfactorily poured.

The methods used for producing small castings in the malleable foundry are not different from the gray iron works, except in the gating as above mentioned, and hence no space need be given to the matter further than to show a number of illustrations which tell the story sufficiently plain.

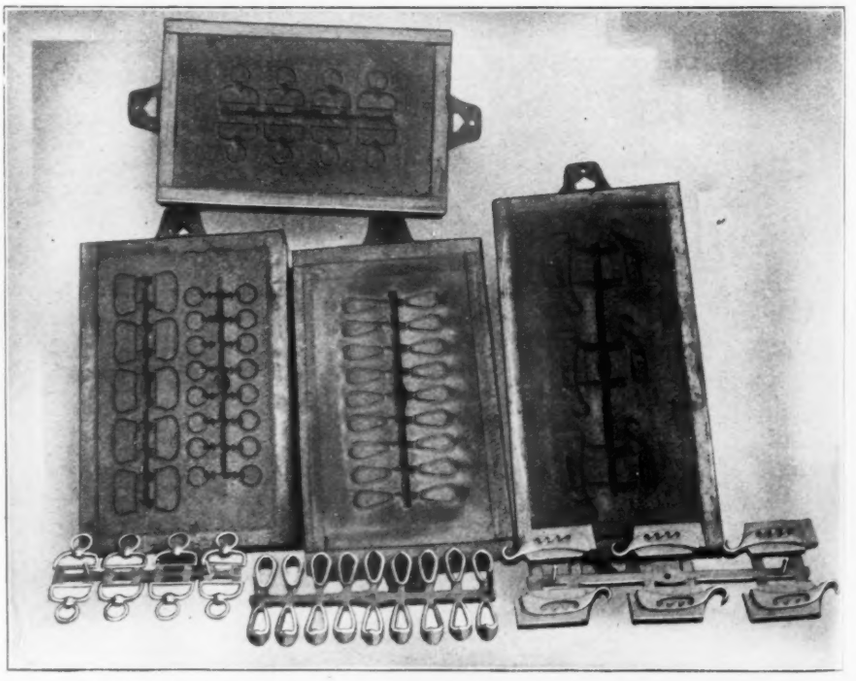


FIG. 7—MATCH PLATES—USED EXTENSIVELY IN MALLEABLE WORK

Fig. 1 shows 10 clevis castings made in one mold (reading from left to right). This batch of castings has just been shaken out and shows very clearly the method of gating, the relative size of castings and runners, as well as the sprue. Next are shown 10 razor strap handles which weigh about half an ounce each. It will be noted that each handle is gated at two points in order to insure free running of the iron without making the gate too thick, and thereby probably breaking the casting itself in knocking it off. Next are shown 16 eyes for the top part of the razor strap swivel. Then the completed swivel, eight castings in a mold. The eyes and the lower part of the swivels are cast separately, the swivel part of the eyes being covered with shellac and sand, this portion of the eye practically forming the core when the lower part of the swivel is made in the mold.

The next view illustrates the method of gating up four street elbows. On the lower left hand corner of the illustration will be seen eight bushings weighing about eight ounces each gated up properly. Next a die stock weighing about nine pounds. This is gated as shown and allows the metal to flow very freely. A friction drive gear casting is shown next, the sprue being unusually small. The casting weighs about 50 pounds. The other two castings are used in connection with the die stock, and are also malleable.

### Chandelier Patterns.

Fig. 2 shows a lot of chandelier metal patterns, with the method of gating and location of the sprue shown very plainly. Reading from left to right we have first chandelier patterns, then another pattern, then patterns of fence pickets, again chandelier parts, all carded, and 26 carded patterns for one mold, in the lower left hand corner.

Fig. 3 shows carded patterns for 48 lock nuts, each weighing about an ounce apiece; 16 patterns of a saw handle clip, each casting weighing about three ounces. The third carded pattern set is for 81 ⅛-inch pipe plugs, which weigh less than ½-ounce each. In the center are shown eight 1½-inch elbows just cast and not yet knocked off the gates.

Fig. 4 shows a mold for ¾-inch street elbows, made on a machine, a pattern plate having been used. It shows the method of gating nicely.

Fig. 5 is a similar mold, containing eight 1½-inch elbows.

Fig. 6 shows a mold for making razor strap swivels, the eye of the swivel being shown in the mold. As previously stated, the shank is coated with shellac and sand. After annealing and tumbling, the eye can easily be rotated, but not so in the hard.

### Match Plates.

The match plate is a very important factor in the malleable shop, great care being exercised in getting it right where much work is to be done. The subject is of course familiar to every foundryman, and hence only one view is shown herewith in Fig. 7.

Here we have a varied lot of match plates. At the top is shown one for molding razor strap swivels. Below at the left is shown a match plate for the eyes of the razor strap swivels and the handles. Next to this is the match plate for another small section. Lastly the match plate for a saddlery hardware casting of a more difficult nature.

The matches themselves are made of sand hardened with litharge. Matches can, of course, be made of many products. Thus common clay will do all right for a small job and will last for some time successfully. Plaster matches are more generally used, especially if hardened with cement to insure better wear.

The subject of mounting patterns is a very important one, and numerous methods have been brought out to facilitate this work. Practically every maker of molding machines now develops a method peculiarly adapted to his uses and much ingenuity is displayed. Attention is called to the paper on the subject written by S. H. Stupakoff, for the American Foundrymen's Association, and presented at the Milwaukee convention, in which he describes a universal method of mounting patterns using a jig plate accurately bored and allowing of a quick placing of a number of patterns with great accuracy.

Another method, used for the Berkshire molding machine, and described in the November issue of THE FOUNDRY is very interesting, that part in which half of the plates are recessed on one side for making green sand cores should be studied, as it simplifies many a problem in making castings on machines.

# VALUE OF LIQUID FUEL IN BRASS FOUNDRY PRACTICE*

BY W. N. BEST

IN THIS age, which demands from every modern brass foundry not only quality of output, but also quantity, liquid fuel naturally appeals to every foundryman because it contains a higher calorific value than either coal or coke and with it, any degree of heat desired can easily be attained and maintained at the will of the melter.

To prove this statement we will consider the calorific values of crude oil, tar, denatured alcohol, coal and coke.

Texas crude oil, calorific value per pound, 19,060 B. T. U.

Residuum oils, calorific value per pound, varies from 18,350 to 19,342 B. T. U.

Denatured alcohol calorific value per pound, 13,140 B. T. U.

Bituminous coal (Pittsburg), calorific value per pound, 12,141 B. T. U.

Bituminous coal (Illinois), calorific value per pound, 10,506 B. T. U.

Anthracite coal, calorific value per pound, 13,189 B. T. U.

Coke, calorific value per pound, 13,000 B. T. U.

### Burners for Liquid Fuel.

The success obtained from the use of liquid fuel depends largely upon the hydro-carbon burner used. There are possibly thousands of different burners upon the market today, of which the majority are of the internal mixing or injector type. In these the fuel and the atomizing agent flow out in the same direction. In another type of burner, known as an external mixer, the fuel flows down upon a sheet of steam or air and is thus carried into the furnace or fire-box of boilers. It can readily be seen that in neither of these two types of burners is the fuel broken into particles or thoroughly pulverized by the atomizing agent. We are aware that the more volatile fuels require very little atomization, but if the burner used is not of such form and capacity as to insure the thorough atomization of any grade of liquid fuel, the foundryman will be in a sad predicament whenever a shipment of low grade fuel is sent him. I always recommend

*Presented at the annual meeting of the American Brass Founders' Association.

an external mixing burner having the fuel orifice below the atomizer cavity, as this prevents the fuel from solidifying or carbonizing over the atomizer slot; and as the fuel passes out of the nose of the burner in a perpendicular manner, while the atomizing agent passes out horizontally, the thorough pulverization or atomization of the fuel as well as the even distribution of the flame in the combustion chamber is effected.

**Regulating Device.**

As crude oil is of two varieties, the one having asphaltum base, the other paraffine base, and as tar often contains lamp-black, I always recommend the use of a special regulating cock, which insures both a steady flow of fuel to the burner and the minute regulation of quantity of same. The plug of this regulating cock has a V-shaped knife-edged opening on the intake side, while the exit has a large opening, and thus the residuum which may be in the fuel cannot stop the flow. If a globe or needle valve be used to regulate the fuel supply to the burner, the space that the valve parts from the valve seat is so slight that the residuum in the fuel soon collects therein, causing great annoyance. This is especially noticeable when low gravity fuels are used, for then the valves frequently become so clogged that the supply of fuel is entirely cut off.

**Air Consumption.**

Theoretically, it requires 13½ to 14½ pounds of air to effect the perfect combustion of 1 pound of oil. Allowing 14 pounds at 62 degrees Fahr., it would require 184.97 cubic feet of air to effect the perfect combustion of 1 pound of oil, or at 100 degrees Fahr. it would require 197.34 cubic feet. In actual practice it has been found that it requires from 17½ to 19½ pounds of air to effect the perfect combustion of 1 pound of oil, and allowing 19 pounds at 62 degrees Fahr., 249.68 cubic feet are required, or, at 100 degrees Fahr., 267.82 cubic feet. Considering 1 gallon of oil to weigh 7½ pounds, it practically requires 142½ pounds of air to effect the perfect combustion of 1 gallon of oil, or 1,872 6/7 cubic feet of air at 62 degrees Fahr. At 100 degrees Fahr. 2.009¼ cubic feet are required. If compressed air be used as the atomizer, only about one-sixth of the air needed for the perfect combustion of the fuel is obtained through the burner, the rest being furnished through an ordinary air nozzle placed immediately under the burner.

I have often been asked to give an estimate upon the cost of compressing air per cubic foot. Vain, however, have been my attempts to give a definite answer to this question, for there is such a vast difference between theory and practice, and furthermore the conditions in no two plants are precisely alike. In some works, steam driven compressors are used, while in others there are compound compressors. Some employ electrical power to compress the air, while others use gasoline engines. Again, too, if steam driven compressors are considered, the many grades of coal vary as much in calorific value as they do in price.

**Supply Tank.**

To those who contemplate installing liquid fuel in their plants a few words in regard to the supply tank, etc., may prove of interest. To conform with the requirements of the underwriters as well as the various city ordinances, it is necessary that the fuel supply tank (varying in capacity from 1,000 to 10,000 gallons) be placed some distance from the buildings. It should be provided with a vent pipe extending at least 2 feet higher than the shop building and placed 10 feet or more from any chimney or smoke stack. Ten or 12 pounds pressure is usually maintained on the fuel line and an ordinary steam driven brass lined duplex pump or a belt driven triplex plunger pump may be used to pump the fuel. A pulsometer, with gage and a pressure valve with an overflow pipe connecting with the storage tank, should always be placed upon the fuel line so that when one or more of the burners are closed off, an even pressure will be maintained upon the fuel supply pipe line to the other burners by the release of excess oil through the pressure valve, the fuel returning to the storage tank through the overflow pipe.

**Fuel Oil Melting Furnaces.**

In this article I do not deem it necessary to mention the various types of liquid fuel brass melting furnaces, for doubtless our members are familiar with both the open-fired and crucible furnaces and know of the convenience and various economies effected thereby, such as no handling of fuel, no sifting and disposing of the ashes, the increased output of superior quality and that as the heat may be increased or decreased at will, any alloy may be melted. But whatever the type of furnace, I always recommend that a combustion chamber, built along scientific lines, be used, for it directs the course of the heat in the furnace and provides for the union of the air requisite for perfect combustion with the consuming fuel before they reach the furnace proper. Those who have given the fuel of the twentieth century a most thorough test have proven conclusively that it is the incomparable fuel for all work connected with the brass foundry, core-drying as well as melting, etc., but in order to obtain the highest possible efficiency from the fuel, modern equipment must be used in every detail, the fuel must be thoroughly atomized by the hydro-carbon burner, the fuel supply must be constant at all times and the furnaces must be constructed to meet every requirement.

## ALUMINUM IN CAST IRON.

By W. J. Keep

*Question:*—We are very much interested in your suggestions in the June FOUNDRY regarding the use of aluminum to obtain sound castings. In common with others we have suffered the annoyance of defective work. Our coke is very low in sulphur and on account of the light work that we make we are obliged to run our silicon up to 3 per cent. We have tried to use chills in some of our molds, but these do not seem to prevent the trouble. We have also used aluminum in the ladle but the results were not at all satisfactory.

*Answer:*—Iron containing 3 per cent silicon is only satisfactory for light hardware and you will find it difficult to make sound castings of any considerable size with such iron. It is usual to run one charge at the beginning of the heat with low silicon for such castings. Be sure that the mold is well vented, use a skimming gate and keep the sprue full when pouring. Pour the iron as dull as it will run. I am inclined to believe that you are using casting aluminum in your experiments. Would suggest that you purchase aluminum in ⅜-inch rods. This aluminum is pure and you should use a piece ranging from ½ to 1 inch long in a 60-pound ladle. Its use simply eliminates the gas in the iron.

## VANADIUM.

Ferro-vanadium is another alloy that has recently been introduced to the iron founder for his consideration. It greatly increases the strength of cast iron and can be used to advantage in car wheel manufacture. It also greatly reduces the porosity of cast iron.

# THE JOBBING BRASS FOUNDRY—IV

## Evolution of the Job Shop—Various Classes of Work Including Breakdown Jobs—Pattern Problems

BY J. F. BUCHANAN

SOMEONE has said that it is "hard to get on, harder to get honor, harder to get honest." Without seeking to defend that statement in any particular, we feel sure the author must have experienced hardships quite equal to those ordinarily present in the jobbing end of a foundry business, for there the positive, comparative and superlative degrees of hardness, as applied to jobs, must sooner or later appear and be grappled with, even if only the traditional failures of the machinery world continue. This makes it obvious that the jobbing foundryman has very little control over the variant nature of the jobs which come his way. So far as jobbing is concerned, it is always the unexpected that happens. He must, therefore, be prepared to undertake work of every description within the capacity of his plant. Hence those hardships, which are often blessings—trade blessings—in disguise.

### Evolution of the Jobbing Foundry.

As a rule a jobbing foundry begins in a small, unpretentious style, and as a rule it develops into a big, solid, all-embracing concern. That is the natural law of the jobbing world everywhere. But the jobbing foundryman does not adhere to jobbing only, for the simple reason that repairs, or jobbing work proper, is very low diet to a man with a healthy appetite for business, not to mention enterprise. Some staple trade is sure to be absorbed with the jobbing, and although a foundry may have commenced as a jobbing shop, it is not precluded from entering into competition for specialty work for which it may be well adapted.

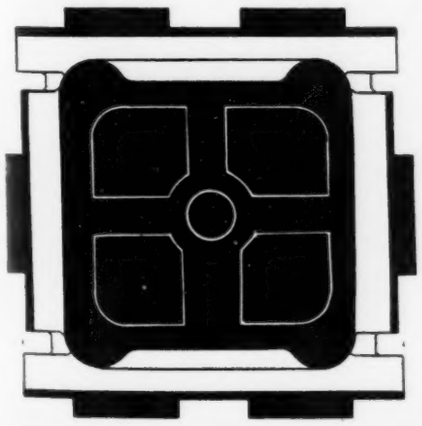


FIG. 1—PLAN OF THE DRAG PATTERN

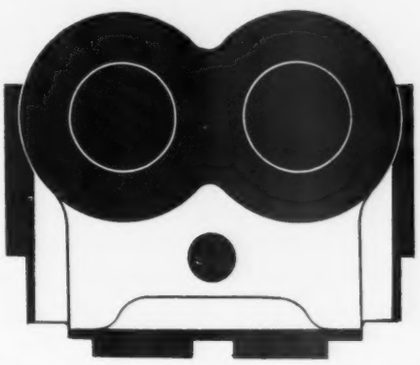


FIG. 2—POSITION OF THE PATTERN IN THE MOLD

"Once a jobbing shop, always a jobbing shop" is not a fixed principle in foundry ethics, but we have an unwritten law that a jobbing foundry should not refuse work, however difficult or troublesome, unless on the plea of incapacity—a sorrowful admission that the business is not yet full grown. This word "jobbing" is a mean kind of word, but the work ranks high in the estimation of craftsmen and engineers are always deferential where the ability of the jobbing molder is concerned.

### The Jobbing Foundry Menu.

Indeed, the admiration of all sorts and conditions of designers and engineers for the craftsmanship of the jobbing molder is something to marvel at unless we assume that foundry work is at the base of engineering progress. In days of old, "jobbing" was the universal menu of foundryland, but in these days it is the fashion for every foundry to have its own special bill of fare, which may either include jobbing as the chief course or only as a side dish. Foundry work is so highly specialized in our day that jobbing foundries are being equipped so as to cope with a few particular lines, local jobbing work of some definite grades and contract jobs for stated periods or quantities.

Since there is no clear line of demarkation separating quasi-manufacturing and jobbing work, we can only deal with jobs and jobbing, fragmentary fashion. By recapitulating a few personal experiences on the so-called jobbing ranges, and presenting a sort of foreshortened view of this branch of founding (which is sometimes regarded as the lower strata of the foundry industry) some of the difficulties and many of the resources of jobbing foundry practice may be better appreciated by the general trade. It seems strange that the jobbing foundryman should be classed as a kind of "under dog" in the metal castings trade. Perhaps his disregard of "system" may be the reason. But surely the conditions of jobbing justify a more flexible administration, and the jobbing foundryman cannot be expected to keep his house in order by the same rigid routine as the manufacturer who knows what his work for tomorrow is going to be.

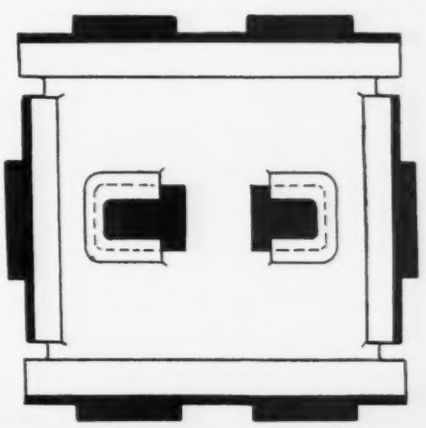


FIG. 3—PLAN OF THE COPE PATTERN

The same reasoning applies to the jobbing foundry equipment. A promiscuous assortment of old and new appliances is the natural hoard of a mixed trade. Some of the old tools are indispensable in jobbing work, and some of the new ones are undoubtedly good and serviceable, especially when you are cutting into open contracts. But you must not go to extremes, or suppose that any old thing will do for a jobbing foundry plant.

**Hand Versus Machine Molding.**

There is no valid excuse for compelling your molder to grope around the corners of the work by the flicker of a tallow dip or a smoky oil lamp in a city where the cheap, portable gas bracket, or the clean, bright electric fluid are so easily installed. Jobbing is barometrical business. You must be ready to adapt yourself to sudden changes; ready to expand or curtail

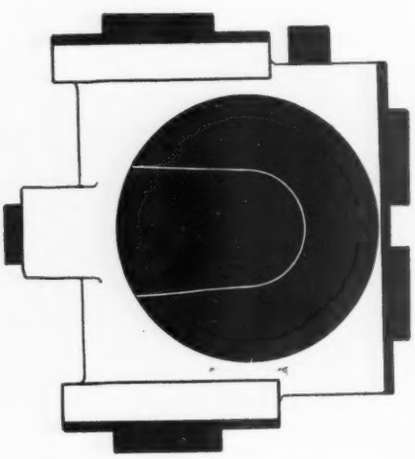


FIG. 4—THE COMPLETED PATTERN

your efforts and expenses with every rise and fall; and so, there are two men who should not start out in the jobbing foundry business—the impecunious novice and the unresourceful plodder; and, if a third might be added, the mechanical enthusiast who is a man with a theory.

Just how much has been gained in output by the adoption of molding machines is a simple problem in arithmetic; but a very small margin of the total belongs to the jobbing foundry. On the other hand, just how much has been lost in skill, in the rank and file of molders, by the introduction of brainy machines, would require a long and wordy conference of foundrymen to elucidate. Machine molding versus hand molding is always a good subject for discussion until we butt up against the breakdown job, and then power receives the knockout. In general foundry practice machines soon touch the limit, but where an unvarying product is the objective there is hardly any limit to the possibilities of mechanism. The foundry product, then, should automatically mark the dividing line between hand and machine molding. And yet, such a potent factor is the molding machine in modern foundry practice, that many lines which, but a few years back, we thought only the skilled molder could be trusted to handle, have been harnessed to machines with unqualified success.

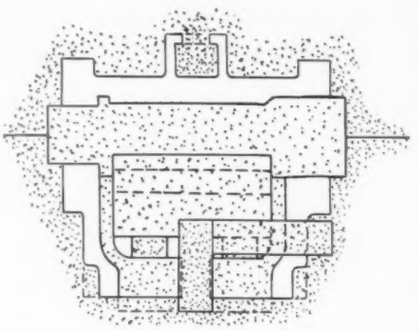


FIG. 5—SECTION OF THE MOLD WITH CORES IN PLACE

Some there are who proclaim the triumph of mechanical art by exhibiting a half mold fresh from the squeeze-jolt-jar-rockover-vibrating-gravity-stripping-molder.

**The Decline of the Molder.**

Others hold that the veriest "Lafayette among molding machines" (and Lafayette undoubtedly stands for effective artistry) can never supplant the skilled molder in any but the elementary grades of work. Both views are right. The recognized canons of foundry practice have sometimes been sacrificed to a mechanical device, and the decay of the molder has come on because he has been mentally disabled by several strokes of genius—mechanical genius. The experience of the good all-round molder (who is, by the way, becoming a *rara avis*) was formerly obtained in circumstances which have almost disappeared from modern foundry practice.

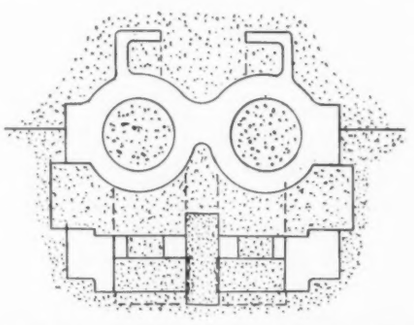


FIG. 6—ANOTHER VIEW OF THE MOLD WITH CORES IN PLACE

This is the age of *machinery* and in every organized industry, mechanical operations cut a conspicuous figure, and molding machines are but a phase in the modern developments affecting the production of castings. The new style of foundry practice is just beginning to make headway. The three M's—metallurgy, mechanics and mathematics—are essentials to the modern foundry graduate.

An old-time molder thinks molding machines are clever contraptions for crushing countless, conventional castings out of a sand heap and a crucible. The molder's duty is to stand by the handle and to empty the crucible! "That," he exclaims, "accounts for the decline of the good molder." In a few more years the men who are engaged in this great foundry industry will fall into two divisions, the men who make

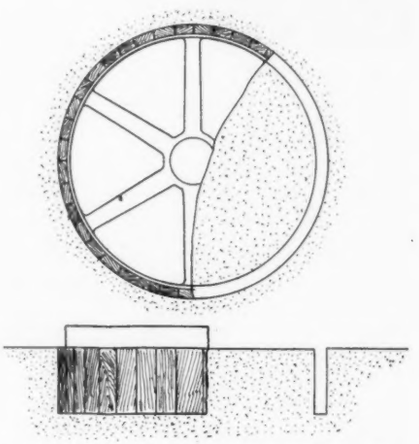


FIG. 7—A MAKESHIFT PATTERN FOR HURRY WORK

molds in millions, and the men who make millions in molds. Things will be done automatically, without sweat or worry; the million-mold men will be trance-workers, the million-dollared men gods, and then—No! not the milenium, but a common, irritating, old-fashioned sort of pull-you-up-with-a-round-turn-break-down job, will initiate the search for the discovery of a jobbing foundry and stimulate the study of hand molding for emergencies. Thus, in spite of day dreams and the miraculous machines, we are brought back to real life, brain-work and job-molding as it is, and (for some considerable time) shall be.

**The Jobbing Superintendent.**

When you have exhausted the possibilities of repair in a breakdown job it is time to consider ways and means of getting through with bespoke orders for brand new castings and finishing "on time." You see, mental alacrity

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication.

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note-book form.

## *STANDARD SPECIFICATIONS FOR CAST IRON PIPE AND SPECIAL CASTINGS.**

*(Continued from Data Sheet No. 22.)*

### Tests of Material.

Specimen bars of the metal used, each being 26 inches long by 2 inches wide and 1 inch thick, shall be made without charge as often as the engineer may direct, and, in default of definite instructions, the contractor shall make and test at least one bar from each heat or run of metal. The bars, when placed flatwise upon supports 24 inches apart and loaded in the center, shall for pipes 12 inches or less in diameter support a load of 1,900 pounds and show a deflection of not less than 0.30 of an inch before breaking, and for pipes of sizes larger than 12 inches shall support a load of 2,000 pounds and show a deflection of not less than 0.32 of an inch. The contractor shall have the right to make and break three bars from each heat or run of metal, and the test shall be based upon the average results of the three bars. Should the dimensions of the bars differ from those above given, a proper allowance therefor shall be made in the results of the tests.

### Casting of Pipes.

The straight pipes shall be cast in dry sand molds in a vertical position. Pipes 16 inches or less in diameter shall be cast with the hub end up or down, as specified in the proposal. Pipes 18 inches or more in diameter shall be cast with the hub end down.

The pipes shall not be stripped or taken from the pit while showing color of heat, but shall be left in the flasks for a sufficient length of time to prevent unequal contraction by subsequent exposure.

### Quality of Castings.

The pipes and special castings shall be smooth, free from scales, lumps, blisters, sand holes and defects of every nature which unfit them for the use for which they are intended. No plugging or filling will be allowed.

### Cleaning and Inspection.

All pipes and special castings shall be thoroughly cleaned and subjected to a careful hammer inspection. No casting shall be coated unless entirely clean and free from rust, and approved in these respects by the engineer immediately before being dipped.

### Coating.

Every pipe and special casting shall be coated inside and out with coal-tar pitch varnish. The varnish shall be made from coal tar. To this material sufficient oil shall be added to make a smooth coating, tough and tenacious when cold, and not brittle nor with any tendency to scale off.

Each casting shall be heated to a temperature of 300 degrees Fahr. immediately before it is dipped, and shall possess not less than this temperature at the time it is put in the vat. The ovens in which the pipes are heated shall be so arranged that all portions of the pipe shall be heated to an even temperature. Each casting shall remain in the bath at least five minutes.

The varnish shall be heated to a temperature of 300 degrees Fahr. (or less if the engineer shall so order), and shall be maintained at this temperature during the time the casting is immersed.

Fresh pitch and oil shall be added when necessary to keep the mixture at the proper consistency, and the vat shall be emptied of its contents and refilled with fresh pitch when deemed necessary by the engineer. After being coated the pipes shall be carefully drained of the surplus varnish. Any pipe or special casting that is to be recoated shall first be thoroughly scraped and cleaned.

### Hydrostatic Test.

When the coating has become hard, the straight pipes shall be subjected to a

*Adopted by the American Society for Testing Materials.



*(Continued from Data Sheet No. 23.)*

proof by hydrostatic pressure and, if required by the engineer, they shall also be subjected to a hammer test under this pressure.

The pressures to which the different sizes and classes of pipes shall be subjected are as follows:

| | 20-inch diameter and larger. Pounds per sq. in. | Less than 20-inch diameter. Pounds per sq. in |
|---|---|---|
| Class A Pipe..... | 150 | 300 |
| Class B Pipe..... | 200 | 300 |
| Class C Pipe..... | 250 | 300 |
| Class D Pipe..... | 300 | 300 |

### Weighing.

The pipes and special castings shall be weighed for payment under the supervision of the engineer after the application of the coal-tar pitch varnish. If desired by the engineer, the pipes and special castings shall be weighed after their delivery and the weights so ascertained shall be used in the final settlement, provided such weighing is done by a legalized weighmaster. Bids shall be submitted and a final settlement made upon the basis of a ton of 2,000 pounds.

### Contractor to Furnish Men and Materials.

The contractor shall provide all tools, testing machines, materials and men necessary for the required testing, inspection and weighing at the foundry of the pipes and special castings; and, should the purchaser have no inspector at the works, the contractor shall, if required by the engineer, furnish a sworn statement that all of the tests have been made as specified, this statement to contain the results of the tests upon the test bars.

### Power of Engineer to Inspect.

The engineer shall be at liberty at all times to inspect the material at the foundry, and the molding, casting and coating of the pipes and special castings. The forms, sizes, uniformity and conditions of all pipes and other castings herein referred to shall be subject to his inspection and approval, and he may reject, without proving, any pipes or other casting which is not in conformity with the specifications or drawings.

### Inspector to Report.

The inspector at the foundry shall report daily to the foundry office all pipes and special castings rejected, with the causes for rejection.

### Castings to be Delivered Sound and Perfect.

All the pipes and other castings must be delivered in all respects sound and conformable to these specifications. The inspection shall not relieve the contractor of any of his obligations in this respect, and any defective pipe or other castings which may have passed the engineer at the works or elsewhere shall be at all times liable to rejection when discovered until the final completion and adjustment of the contract, provided, however, that the contractor shall not be held liable for pipes or special castings found to be cracked after they have been accepted at the agreed point of delivery. Care shall be taken in handling the pipes not to injure the coating, and no pipes or other material of any kind shall be placed in the pipes during transportation or at any time after they receive the coating.

### Definition of the Word "Engineer."

Wherever the word "engineer" is used herein it shall be understood to refer to the engineer or inspector acting for the purchaser and to his properly authorized agents, limited by the particular duties intrusted to them.

is just as needful to the jobbing foundry foreman as the other kind of hustle is to the tradesman.

Quickness of observation and a faculty for meeting emergencies are invaluable, and, if the smash is serious, there is much virtue in a large expenditure of thought. For work of this kind arbitrary rules and fixed rates are of no assistance. Time is generally the most important consideration. Price comes after. Individual study and treatment must be given to every job, and when alternative methods are available, the final vote should be cast for what is judged to be safest for the finished casting, irrespective of cost. Sometimes a patch will give good temporary service and tide over the difficulty while a new casting is being made, but always there is wisdom in adapting the best materials to the immediate needs of the case.

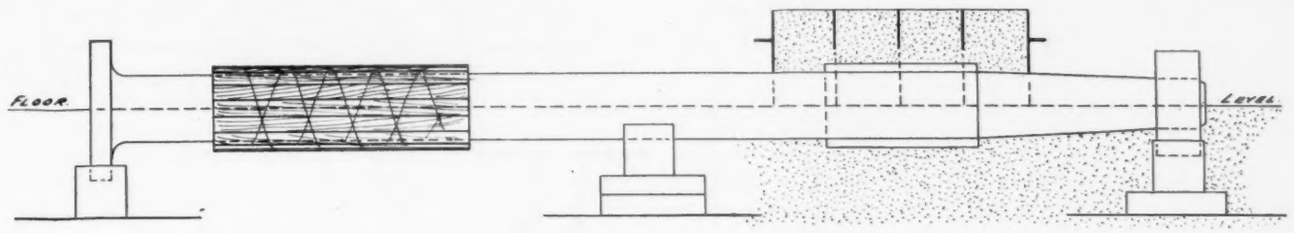



FIG. 8—REPAIRS FOR A PROPELLER TAIL SHAFT

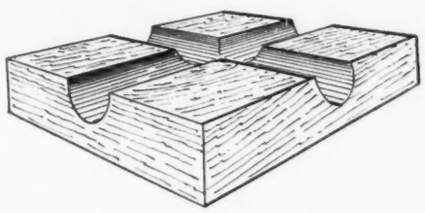


FIG. 9—HALF CORE BOX

It is not an uncommon thing in repair work for a clumsy wooden arrangement to be replaced by a casting or a forging, and in the matter of castings that have failed, brass, gun metal, steel or malleable iron may supersede cast iron with permanent improvement. These and similar pertinent considerations call for rapid review when the question of repair comes on, and so, the man for carrying out jobbing work is the man who keeps oil on the hinges of his "think box." By which I mean to assert the importance of being ready to deal with the unexpected, using unconventional means if necessary. The breakdown has its uses, and probably the brightest feature of any untoward event is the co-operation of all concerned to surmount the difficulty. The first question is not, "How will you do the job?" but, "How long will it take?" And it lies with the patternmaker and the molder to provide the answer.

### A Selection of Jobs.

When the government inspector, the ship's surveyor, the consulting engineer, the fitter and the patternmaker are all in it, and the final decision has not been reached, the practical value of the foundry foreman's advice is not to be despised.

Coming to the actual jobs, a few samples may be selected to illustrate some of the typical features of jobbing foundry work in general and brass foundry jobbing in particular. A "running" job is soon found out. That is to say, if you work continuously at a particular job you soon get hold of the cheapest and best methods of production for that job. A breakdown job, or a "one only" job, is different. The difference is not merely a difference in quantity, for it frequently happens with jobbing work that, instead of a well-built pattern, the broken pieces of the original casting, fastened together with solder, or seizing wire, or service bolts, accompany the order. If the job is at all intricate, the time and expense required for patternmaking weigh in against that department. It follows, therefore, that the jobbing patternmaker must share the honors with the jobbing molder.

Before anything can be done in the way of molding from an old casting, all grease, paint or rust must be removed either by burning off or chipping. Holes may be stopped with clay or wooden plugs. To complete this old-casting style of pattern, core boxes (if wanted) are made to suit the proposed method of molding, and additional parts, as prints, facings for

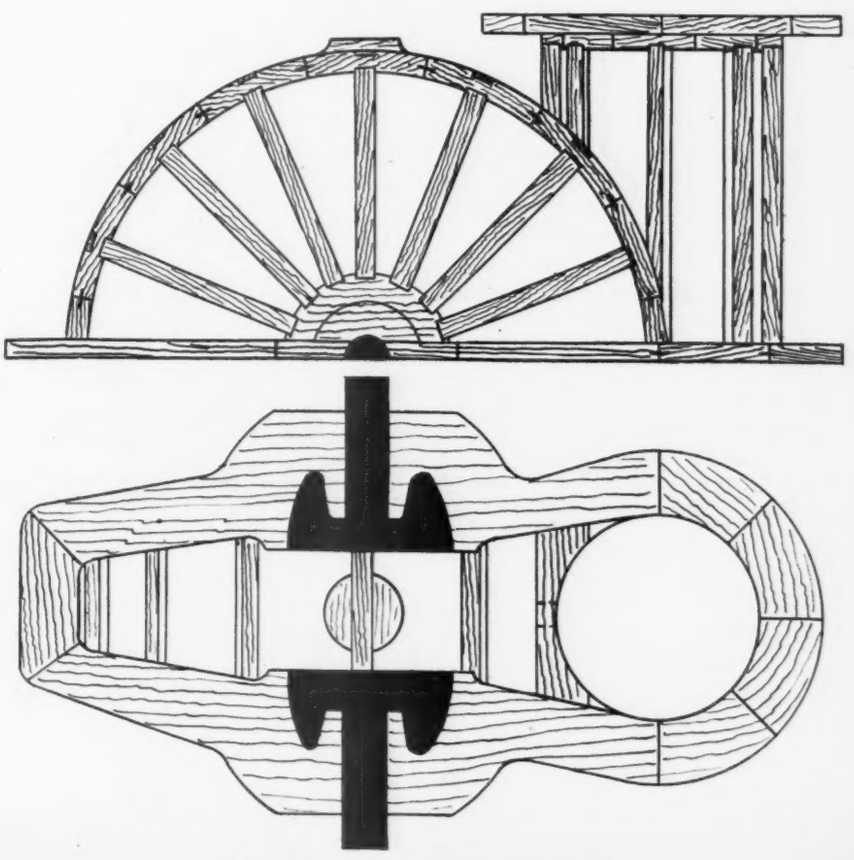


FIG. 10—A LARGE SKELETON PATTERN

machining, and contraction pieces, are fixed wherever they are wanted.

Figs. 1, 2, 3, and 4 illustrate how these additions were applied to a faulty cast iron pump sent from a steamer, with the order for a duplicate in gun metal at the earliest possible hour. The facings, prints, draw prints, etc., are purposely sketched full black, and in Figs. 5 and 6 two cross sections of the mold with the cores fitted are shown. This mold was made in dry sand with the pattern in the position shown in Fig. 2. Fig. 1 would then represent a plan of the drag and Fig. 3 a plan of the cope. The casting weighed 220 pounds, and worked under a pressure of 450 pounds per square inch. Nevertheless, the old-casting style of pattern is not always a profitable thing in the foundry.

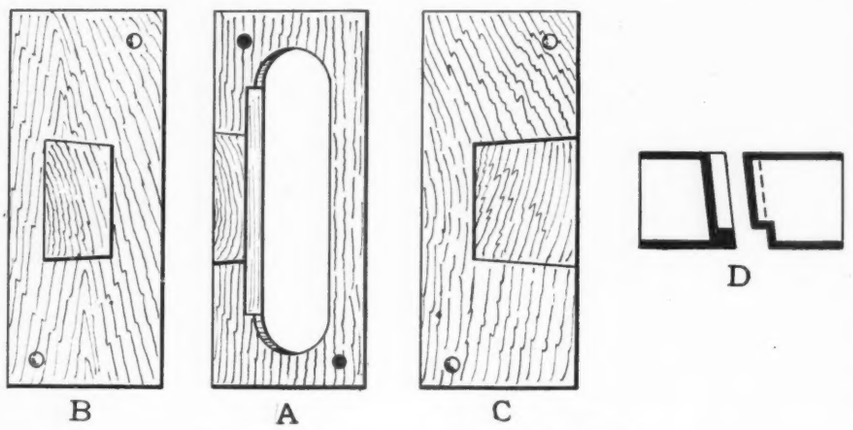



FIG. 11—EXAMPLES OF CORE BOX ECONOMY

### Jobbing Patterns.

A very common engine repair is fitting new piston rings to take up the wear of the stroke. Several of these rings may be cut off one length of the casting, and a very convenient makeshift for getting out this casting in a hurry, where no suitable patterns are kept in stock, is shown in Fig. 7. Any old cylindrical section, a pulley, or a core print, provided it is true and the diameter of either the inside or outside size of the required ring, may form a support for the sticks while they are rammed up. When this is done, the pulley (or block of wood as the case may be) is withdrawn, and the space is then rammed with sand to form the core. If the pulley is large enough to form the outside diameter of the ring, then the sticks (which are the proper depth and thickness) are not lined in position for the core until after the pulley has been drawn. Another application of this idea is seen in Fig. 8. A propeller tail-shaft requires brass liners on the journal bearings. In this case the sticks are tied around the shaft at the parts where the brass is to be run on and a mold is made with them in position. The two views given should explain the process. These castings all have to be machined and any ridges or irregularities, due to the butting of the sticks in a circle, come out in the lathe. The ring casting, Fig. 7, may be made in open sand if an extra allowance is made in the depth for sullage.

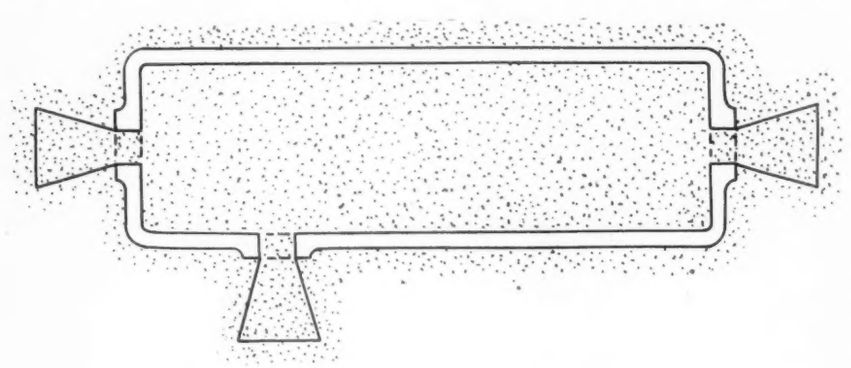


FIG. 12—A NOVELTY IN CORE PRINTS

Jobbing patterns are proverbially crude examples of the patternmakers' art. The advantages of hard varnish or a fine finish are not worth considering on patterns that are not to be preserved for future use, and in consequence the molder acquires the knack of giving the mold the fine finish instead. At the same time, the patternmaker on jobbing gains a wider experience of materials suitable for temporary use in the foundry. Sheet lead, for example, is not recommended for everyday use, but by reason of its flexibility it is a very serviceable material for shaping patch patterns to repair broken or leaking parts of machinery. Plaster of paris, beeswax and gelatin are also good for temporary work, especially where artistic designs are concerned.

### Jobbing Economics.

Although jobbing patterns are not generally built to stand up to prolonged usage in the foundry, they should be put together with the object of helping the molder in the details of his work. Strength and draft are the two most subtle traits of any pattern, and the molder cannot have too much of either. As far as possible the patterns should present a straight-

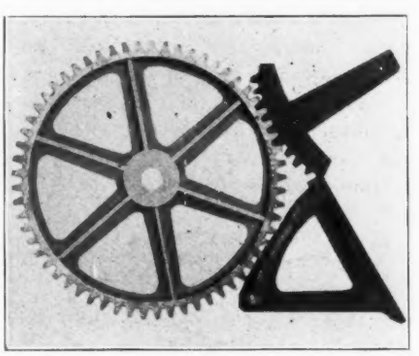


FIG. 13—OBSOLETE PATTERNS FOR LARGE GEAR WHEELS

forward set of operations in the foundry. The brain work of the job should be mostly in the pattern and core boxes, and the core boxes should only be made after the method of molding has been decided. The cores should fit into their proper places in the mold and the prints should have sufficient taper in the right places.

Fig. 12 provides an example of novelty in core prints. The taper is here reversed and very much exaggerated from the ordinary style. For small castings in green sand this style might be advantageous, making the position of the core positive and in perfect register, but for prints of large area, or dry sand molds, the wedge-shaped bearing would be apt to crush in upon the mold with little provocation. The half core box and the paste brush are characteristic parts of the jobbing outfit. We are familiar with a class of patterns which are described like an

excursion ticket—"good for this trip only"—and that device should be tagged on to every half core box. The "half core box," Fig. 9, generally saves $1 in the pattern shop and adds $1.50 to the foundry expense, and the half core box with change pieces and reverse parts is a further development of the same kind of economy.

Of course, there are times when change pieces are a great convenience, as in the rail ends shown in section at D, Fig. 11. To make the core for the female or left hand casting, A is slipped on to B, and for the male part, B is put aside and C is turned over to A. That is true economy, for A serves for both right and left hand cores; whereas the half core box, Fig. 9, can only be used for tees, cross pieces and figures of regular outline, and then the extra expense of making, drying and pasting separate halves may well give pause to those inclined to economize.

### The Benevolent Brass Founder.

There is only one valid excuse for the half core box, and that is the "One Only" order, and on this same order there are usually directions enough to convince the most optimistic that patternmaking is a hobby which requires a firm hand to keep it from running away with the costs. When an old casting is sent along and you are instructed to "Rap it in the sand, pare one inch on each end, increase the thickness at the damaged part," and "Use up the metal of the old casting in the new one," you must understand that the patternmakers' charges cannot be tolerated, and the brass founder is flatteringly regarded as an Aladdin who exchanges new castings for old out of pure benevolence. It is as if the concern that gave the order wrote: "Dear Foundryman, this is what I think of you and I hope you will charge accordingly."

### Skeleton Pattern.

For true economy on large, intricate castings the skeleton pattern is probably the greatest money saver both in the pattern shop and the foundry. Fig. 10 is an example. This casting weighs about 1,000 pounds; it is made in loam and the two views show that the patternmaker has let himself off easy and given the molder a straight run. In pipe work and steam connections where odd sets and bends are usual, the skeleton is first favorite. Aye, it's a poor jobbing foundry that has not more than one skeleton in the cupboard. The "built" pattern, the "split" pattern, and the "finished-all-over" metal pattern are luxuries which the jobbing molder seldom enjoys. He is expected to do odd jobs with the odds and ends of the pattern storage and the foundry debris. If he comes well up to expectations, "He knows his business;" but if he fails, "Here is another proof of the decline of the molder." In up-to-date foundry practice what we might term the "cult of the segment" is beginning to wane. The modern foundryman would not waste his time getting out ordinary sized wheels by the method of Fig. 13, and for larger sizes the loam method would be better. If he did not happen to possess a wheel molding machine, or some kind of a molding machine, as a business man he would let this job to some one better equipped.

### Jobbing Devices.

But the last word on economy in jobbing foundry practice has not been said until the strickle—the most scientific of all the aids to molding—has been mentioned. This should make a profitable subject of inquiry at some future date. Summing up the characteristics of foundry jobbing, we understand that although the work may be casual it is never hackneyed nor surrounded with operative etiquette like the manufacturing output. We have learned that success depends greatly upon co-operation and mutual agreement in planning the work before it reaches the foundry. We have seen that power molding, while it cannot be applied to emergency work, must inevitably displace an ever-increasing amount of general hand molding as time goes on. We have also to admit that many of the prevalent patternmaking devices are absolutely essential to good work in the foundry. There is no need to apologize for the skeleton, the pin-board and sweep, the change piece, the stop-off, the half pattern or the made-up pattern. (This last, like Nebuchadnezer's dream image, may have feet of clay, an iron body and other parts of other materials.) Other devices such as the "stiffening bar," which breaks up the mold surface badly; the solid flange or the fixed hub, which necessitate the return of the whole pattern to mend the cope; the use of driving nails when screws would be advantageous, or drawstraps on a weak spot in the mold, may not appear to the molder in the light of helpful contributions; still, to be consistent, he should allow the patternmaker to be the judge and use such accessories as he thinks necessary to the satisfactory completion of his part of the work.

The molder makes free use of core arbors, flask-pockets, odd-sides, lifters, etc., as aids in the making of molds. These things give him more confidence in his work, and he should be ready to recognize the value of similar aids in other departments.

Some special features of brass foundry jobbing practice are: Casting two or more different alloys from one pot of metal by adding various compositions as the pouring proceeds; "burning" castings and at the same time catching up, in a hot hand ladle, the overflow which is then poured back into the crucible for filling up molds; casting different jobs at different temperatures according to the alloy used and the working conditions of the castings; the careful collection and grading of shop scraps; the pouring of all spare metal into clean ingots, and continuous melting. A description of these and many more matters of importance in brass melting and molding practice could be made very interesting even to the general foundryman, but this paper has already reached the limits of an article.

The brass founder is the handy man of the engineering fraternity. He casts in so many metals and alloys of merit and general utility for constructional and mechanical work that only the question of price, or market values, prevents him from becoming *the foundryman in excelsis.* Anyway, for breakdown work he is "all there," and as there must always remain a big reserve of foundry work and molding which is not amenable to mechanical treatment, the jobbing foundry must still survive, and so say all of us. Besides, the eminent sociological apologist, Dr. Saleeby, has said: "The products of progress are not mechanisms but men." This is verified in foundry progress by the fact that the most practical men generally graduate from the jobbing floor. Again, "and so say all of us."

---

## HIGH PRESSURE YELLOW BRASS MIXTURE.

*Question:*—We would like to have a good mixture for yellow brass that is tough and will withstand a high pressure of gas or gasoline. When machined, drilled and threaded no leaks can be tolerated.

*Answer:*—Yellow brass is unsuited for such work, and the chances are you will have to fall back on a good red metal. If you wish to use yellow brass, however, try this mixture: Copper, 10 pounds; zinc, 6 pounds; silicon-copper, 4 ounces.

Use new metals and run the first melt into ingots. This metal will rival the best manganese bronze in strength and is extremely ductile. K. K.

# A UNIFORM FOUNDRY COST SYSTEM*

## A Memorandum on Foundry Costs Prepared by the Cost Committee of the American Foundrymen's Association

BY ELLSWORTH M. TAYLOR

THE CHART shown in the accompanying illustration, has been made as simple as possible, and is designed to illustrate merely the elementary principles of the burden of sur-charge distributions agreed upon as the standard units to be used by all foundrymen.

It is not intended to be a complete cost system in itself, nor should the arrangement of the items in the different sections necessarily be maintained, so long as the various kinds of labor and material are distributed to individual costs in accordance with the formula shown.

Briefly stated, it has been determined that, in order to correctly obtain the cost per pound of good castings, according to classes or individual patterns, after the cost of the metal and direct or applied labor has been ascertained, certain kinds of burden or sur-charge labor and materials must be distributed to each class into which the product may be divided in two general ways:

(1). According to weight of good castings.

(2). According to a percentage of the direct or applied labor used in producing each class.

And in order to get a clearer insight into the subject let us discuss the various sections of the chart in the order in which they occur. We will then take up in a general way the application of the principles to different kinds of foundries.

### Metal.

This section of the chart requires little explanation. It is simply necessary for the foundryman to make up his report showing the cost of the metal *actually consumed* in the making of *the good castings produced.*

This means a fairly close check on what goes into the cupola, and what we ultimately get out of it.

### Burden on Metal Distributed to Classes on Basis of Weight.

This section of the chart shows in a general way the kinds of labor and materials which will be distributed to classes or individual patterns in accordance with the *weight of good castings* into which the product may be divided.

In studying the items named in this section of the chart it should be remembered that the arrangement is perfectly elastic, and may be modified and enlarged upon according to the individual requirements and desires of each foundryman. The examples given are merely to illustrate the kinds of labor and materials which are to be included in this section.

It is suggested, however, that in arranging the items in this section, the foundrymen group together those expenditures which relate to the successive steps through which the metal passes from the pig up to the finished castings.

For example:

1. Cost of metals delivered at yard.
2. Cost of materials and all expenditures to cupola.
3. Cost of materials and labor to cover molten iron in ladle.
4. Cost of molding supplies and all items incidental to the same.
5. Cost of all general and miscellaneous items which must be distributed into the costs on a basis of weight of good castings.

The total cost of these items when divided by the weight of the good castings gives the number of cents per pound of burden or sur-charge cost to be apportioned to each class of castings or individual patterns into which the production may be divided.

The grouping of the items in this way is to enable the foundryman to analyze his costs logically and make comparisons for the purpose of detecting excessive expenditures.

It is sometimes the wish of the foundryman to group these and other items so as to put the responsibility for the economical handling of the iron in the various stages up to certain foremen or individuals.

All of these matters, however, must be decided according to individual desires and conditions.

### Direct or Applied Labor.

The subdivisions in this section are merely suggestive. The list must be added to or decreased to meet conditions. As stated in the note, it is not always possible to class all of the labor of these employes as direct or applied labor, and likewise it is sometimes possible to class all or part of the labor of pattern makers, carpenters and blacksmiths as applied or direct labor.

The rule is that all labor is direct or applied when capable of direct distribution to any class of castings or individual patterns, and when it would be included as a direct labor charge in making up the cost of an individual job. Otherwise the labor items must be classed as burden or sur-charge cost.

The foundryman should be careful to observe this rule when figuring detail costs, as the percentage of burden or sur-charge apportioned to individual costs on a basis of direct or applied labor is obtained by dividing the total cost of the section—"Sur-charge on applied labor distributed on per cent basis" by the total of the "Applied labor" section.

Therefore, if we include in the applied labor section any considerable amount of labor which does not come within the above named definition of direct labor, we are apt to develop a percentage rate which will not cover our real burden or sur-charge.

### Commercial Costs.

This section is intended to cover all costs beyond the shipping office door which have to do with the selling of the product.

Consequently item 80 of the chart—"Administration"—should be understood to mean only that portion of the executive cost which is used for the benefit of the selling department. The balance of the administrative cost should be included in item 66—"Proportion of general office expense"—or may be made a separate subdivision thereof.

Item 81 of the chart—"Sales costs"—may be subdivided as each foundryman desires; for example, salesman's salaries, salesmen's commissions, traveling expense, etc.

In apportioning the commercial cost to the classes into which the product may be divided the unit of distribution should be made up on a basis of equity, taking into consideration the real conditions governing the sale of each class, such as the amount of sales, the costs up to the "Commercial costs section," the difficulty

(Note—The numbers and letters used in this paper do not refer to the numbers against the items on the chart except where specifically stated. They are used here to permit of a logical arrangement and for the purpose of cross reference within the paper itself.)

*Presented at the annual meeting of the American Foundrymen's Association.

in making sales, the volume of advertising, etc.

Individual conditions must be carefully studied before the unit of distribution for this class of costs is adopted.

### Summary of Costs.

After completing the arrangement of the sections described above we are in a position to secure a summary of costs which may be drawn up as submitted below, changing the arrangement to meet individual conditions.

basis of weight of good castings."

(b) Cost of items to be distributed as "Sur-charges or burden on basis of per cent of applied or direct labor."

(5) Total cost of output.

(6) Commercial costs.

(7) Gross cost of output.

(8) Net cost of metals used per pound of good castings, obtained by dividing item (2) by item (1).

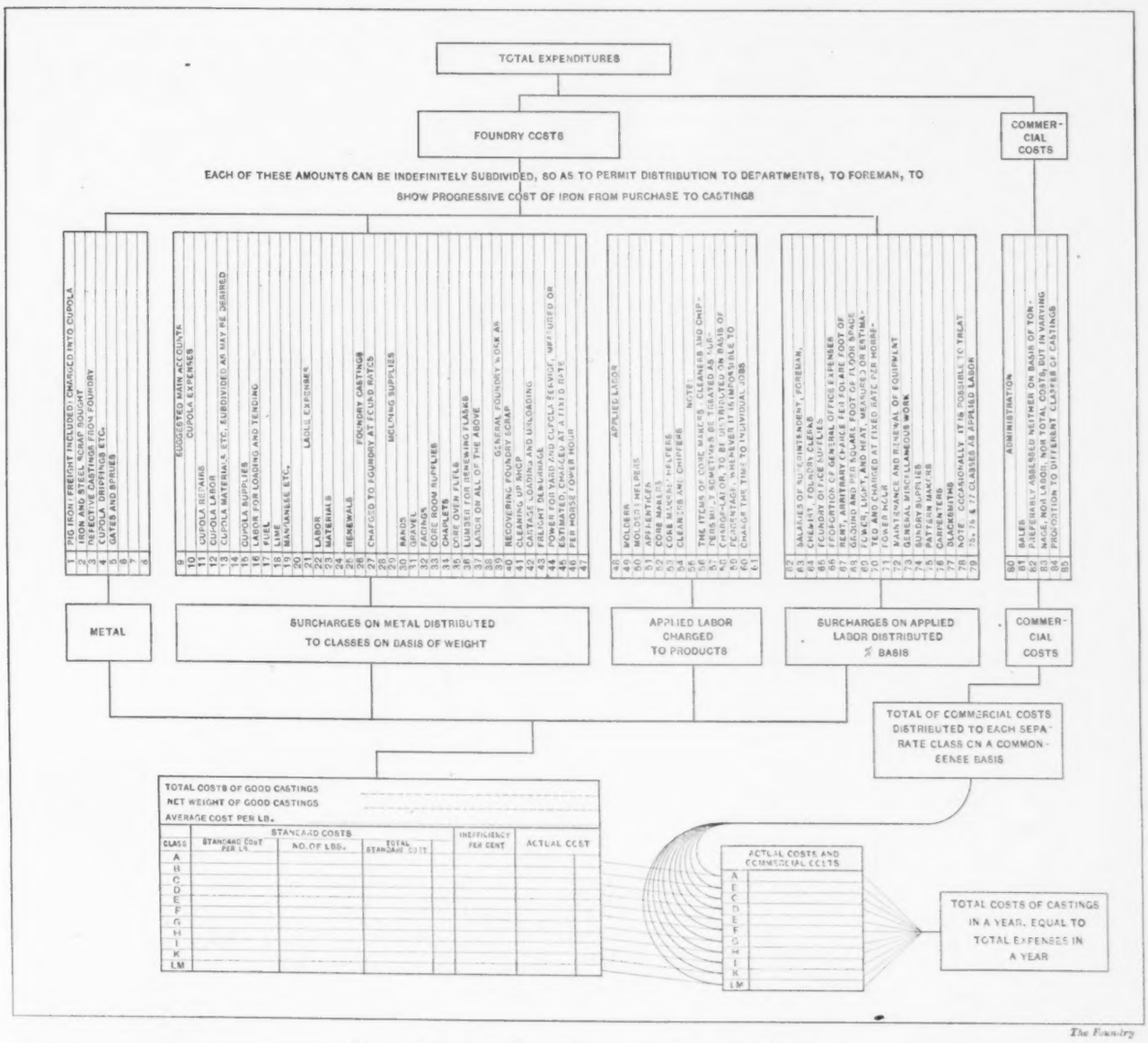
necessary for all kinds of foundries, and must be used to meet the conditions in the five general classes of foundries described below, and all others.

### The Small Jobbing Foundry Selling Its Entire Product to the Trade.

This foundry wants to know:

(a) What is the gross cost of production? See items 5 and 7.

(b) How should we figure the cost of an individual casting? Multiply the weight of casting by item (8). Get the


TOTAL EXPENDITURES
FOUNDRY COSTS
COMMERCIAL COSTS
EACH OF THESE AMOUNTS CAN BE INDEFINITELY SUBDIVIDED, SO AS TO PERMIT DISTRIBUTION TO DEPARTMENTS, TO FOREMAN, TO SHOW PROGRESSIVE COST OF IRON FROM PURCHASE TO CASTINGS
METAL
SURCHARGES ON METAL DISTRIBUTED TO CLASSES ON BASIS OF WEIGHT
APPLIED LABOR CHARGED TO PRODUCTS
SURCHARGES ON APPLIED LABOR DISTRIBUTED % BASIS
COMMERCIAL COSTS
TOTAL OF COMMERCIAL COSTS DISTRIBUTED TO EACH SEPARATE CLASS ON A COMMON-SENSE BASIS
TOTAL COSTS OF GOOD CASTINGS
NET WEIGHT OF GOOD CASTINGS
AVERAGE COST PER LB.
CLASS
STANDARD COSTS
STANDARD COST PER LB.
NO. OF LBS.
TOTAL STANDARD COST
INEFFICIENCY PER CENT
ACTUAL COST
ACTUAL COSTS AND COMMERCIAL COSTS
TOTAL COSTS OF CASTINGS IN A YEAR, EQUAL TO TOTAL EXPENSES IN A YEAR

*The Foundry*

CHART SHOWING DISTRIBUTION OF FOUNDRY COSTS

The grand summary will be based on the following data:

(1) Total good castings produced.

(2) Cost of metals used.

(3) Cost of applied labor.

(4) Cost of total sur-charge divided into:

(a) Cost of items to be distributed as "Sur-charges or burden on metal distributed on

(9) Burden of sur-charge to be distributed to individual costs on a basis of per pound of good castings, obtained by dividing item (4a) by item (1).

(10) Burden or sur-charge to be distributed to individual costs on a basis of per cent of direct or applied labor, obtained by dividing item (4b) by item (3).

The examples given in this schedule illustrate the classification of costs necessary

cost of the direct or applied labor used to produce the casting. Multiply the weight of casting by item (9). Multiply the direct labor by the percentage rate obtained by item (10). The total of these amounts is the cost of the casting up to the shipping office door. Add the proper proportion of item (6). The total is the gross cost of the casting.

(c) Suppose it is desired to divide the

production into two or more classes, say, for example, "heavy work" and "light work" so that we may obtain the average cost of these classes without getting the detail cost of each casting? Separate item (1) into "heavy work" and "light work." Keep a record of amount of item (3) used for each class. Then proceed exactly as outlined for (b).

(d) Suppose it is desired to secure the cost of Smith's work, Jones' work, and Brown's work to find out which is the most profitable, and without getting the detail cost of each casting? Separate item (1) according to *customers*. Keep a record of amount of item (3) used for each customer. Then proceed exactly as outlined for (b).

**The Jobbing Foundry Large Enough to be Divided Into Two or More Distinctive Departments.**

(e) Suppose one section of a plant is continually producing large loam castings, and another section produces machine-made castings? Treat each department as a separate business proposition. This means:

Separate item (1) according to departments. Separate item (3) according to departments. Separate item (4a) according to departments. Sub-divide 4a, first, according to those expenditures capable of direct charge to each department; second, according to those expenditures incapable of direct charge to each department.

Examine carefully all of the items in the second sub-division of 4a, take into consideration all of the conditions prevailing in each department and apportion the amounts in accordance with the units of equity which the examination develops.

Separate item (4b) according to departments; first, according to those expenditures capable of direct charge to each department; second, according to those expenditures incapable of direct charge to each department.

Examine carefully all of the items in the second subdivision of 4b, take into consideration all of the conditions prevailing in each department and apportion the amounts in accordance with the units of equity which the examination develops.

Separate item (6) according to departments; first, according to those expenditures capable of direct charge to the sale of castings from each department; second, according to those expenditures incapable of direct charge to each department.

Examine carefully the items in the second subdivision of (6) and distribute the amounts in accordance with the general instructions given under the heading "Commercial costs."

When the above distributions have been made we will find ourselves in possession of two sets of reports. Then proceed exactly as outlined for (b) in order to obtain any detail information.

**The Foundry Selling Its Entire Product to Its Own Machine Shop.**

With this class of foundry the first step is to treat the two properties as separate institutions. Draw the line sharply between expenditures made for each property, and consider the foundry as an outside concern.

Fix the selling prices of the castings to the machine shop, taking into consideration general market conditions, and the fact that the foundry will be relieved of the usual commercial or selling expense. The foundry must then operate within these theoretical selling prices in order to be profitable.

The next thing to consider is whether the foundry is large enough to warrant subdividing it into departments.

If it is not necessary to make these departmental subdivisions we will obtain our costs and detail in the same general manner as outlined for (a) and (b).

If a departmental subdivision into departments is advisable for any reason proceed in the manner outlined for (e).

**The Small Foundry Selling Part of Its Products to the Trade.**

This class of foundry may be handled in several ways, the suggested division of the production being:

First.—Cost and profits on castings sold to outside customers.

Second.—Cost and profits on castings sold to machine shop.

To get this information proceed as outlined for (d), being careful to apportion the commercial or selling costs as between the two divisions of the product.

If we wish to obtain detail costs proceed as outlined for (b) and by posting these costs against sales we may get profits on individual jobs or by any class desired.

If we desire to divide our product first into perhaps "heavy work" and "light work" without going into the detail cost of each job, proceed as outlined for (c). And if it is still our wish to secure figures in the broad divisions of:

First.—Costs and profits on castings to "Outside customers."

Second.—Costs and profits on castings to machine shop.

We must divide (1) and (2) into the pounds of "heavy work" and "light work" in each class, and multiply, the amounts by cost as developed by (c).

If we further wish to sub-divide costs of "Work for outside customers," by customers, such as Brown's work, Jones' work, etc., we must know the pounds of "heavy work" and "light work" produced for each. Then multiply the amounts by the cost developed by (c).

**The Large Foundry Capable of Subdivision Into Departments.**

This class of foundry has the greatest complications and likewise the greatest possibilities for the application of the principles enumerated, and as its costs will be determined primarily by a combination of the illustrations given it does not seem necessary to go into much description.

A careful reading of the outline for (e) and for "The small foundry selling part of its products to the trade for cash and the balance to its own machine shop" should give a clear idea of points to be covered.

**General Remarks.**

In reading this paper it should be borne in mind that the intention is to illustrate correct principles of distribution and not to outline a complete cost system.

No attempt is being made to deal with the subject of handling of patterns, the handling of orders, the handling of metals, the record of stock, the books of account, statistics, etc.

All of these matters come under the heading of a cost system, and they were treated of in a general way by the writer in the paper prepared for the convention of the American Foundrymen's Association held in New York City, in June, 1905.

## MELTING MANGANESE BRONZE.

At the July meeting of the Tri-State Foundry Foremen's Association held at Rock Island, D. C. Thompson presented a paper on the melting of manganese bronze. The bronze he described was made from the following mixture:—Copper, 56; copper-manganese, 5; zinc, 36; aluminum, 3. The manganese copper referred to consists of manganese, 35, copper, 65. Referring to the charging of the crucible, he stated that the copper is put into the pot first, together with gates and heads that have accumulated, and when this is melted the zinc is added, the manganese-copper next, and the aluminum is added last. The mixture, he added, should be thoroughly stirred before the crucible is taken from the furnace.

---

The Laclede Christy Clay Products Co., St. Louis, announces the acquisition of the business property and good will of the Jamieson-French Fire Clay Co., Lake Junction, St. Louis county, Mo. Henry K. Lackland, formerly secretary and general manager of the Jamieson-French Co., will be associated with the Laclede Christy Co. in the capacity of manager of its high grade clay department.

# A STUDY OF CUPOLA BLAST PRESSURES

## Results of a Series of Forty-Six Recent Tests—Comparative Conditions in Cupola Practice

BY WALTER B. SNOW

IN THE preparation of a recent paper on "Foundry Blower Practice," the writer sought to establish some definite practical relations between diameter of cupola, blast pressure and rate of melting. That such relations exist in theory is at once evident. The rate of melting in an average cupola depends upon the volume of air supplied; this in turn depends upon the pressure of blast, while the intensity of blast with a given blower is in part dependent upon the freedom of discharge through the cupola. Here, above all, is presented the unknown variable in cupola practice; there is, and can be, no fixed method of charging, nor uniformity in the size of fuel and iron, particularly the scrap. As a result there is a great range in blast pressure requirements between the deep, closely packed cupola and the shallow cupola with very open charges.

### Recent Tests Compared.

An attempt was made to compare a sufficient number of tests to determine some of the conditions and their effect. The result is shown in Fig. 1 which displays comparative conditions in cupola practice based on reports of 46 recent tests. The range in capacity for a given pressure, and conversely, in pressure for a given capacity, is so great as to permit of practically no definite conclusion except as to the maximum output ordinarily obtainable from a given diameter of cupola.

The variety in conditions with certain size cupolas is even better displayed in the following table showing a few records taken at random:

| Diameter of cupola lining in inches. | Tons per hour. | Pressure in ounces, per square inch. |
|---|---|---|
| 44 | 6.7 | 12.9 |
| 44 | 7.3 | 16.4 |
| 47 | 8.4 | 17.5 |
| 49 | 9.07 | 11.8 |
| 54 | 7.65 | 13.6 |
| 54 | 8.75 | 11.0 |
| 54 | 9.41 | 12.5 |
| 54 | 10.2 | 20.75 |
| 54 | 10.6 | 20.62 |
| 60 | 12.35 | 15.5 |
| 60 | 14.75 | 16.8 |
| 60 | 13.8 | 12.6 |
| 74 | 13.0 | 8.68 |

### Difficulty in Making Comparisons.

One manifest difficulty in making comparisons lies in the uncertainty as to the method employed for obtaining the reported figures. There is opportunity for great range in the pressure, dependent upon whether it is taken at the blower, in the pipe, or in the wind-box, whether it is the maximum, the minimum or the average, and whether under any of these conditions the gage was properly located.

The rate per hour is seldom so expressed that there is no question whether it is the tons charged, melted or poured, and whether the time was taken from "blast on" to "last tap," or to "bottom dropped," or even whether it is only the elapsed time between first and last taps.

### Maximum Capacity Curve.

However, out of all this confusion a maximum capacity curve was established as appears in Fig. 1. By a similar comparison of results the maximum pressure required under average conditions for a given size cupola was determined with reasonable accuracy. This is shown in Fig. 2. From what follows it would appear that this can only be considered as approximate; considerable variation in pressure makes but little alteration in the output.

Upon this same diagram is drawn another curve (or rather a series of connected straight lines) showing catalog values in pressures for given cupola diameters as published by a leading blower manufacturer.

Practically all other catalogs and published lists merely give the range in pressure for each size cupola, with a corresponding range in the capacity. It is possible for conditions to exist under which the maximum listed pressure may be required to maintain the minimum tabulated melting rate, while conversely the minimum pressure may in certain cases be sufficient to attain the maximum capacity. Much has been said and written about the necessity

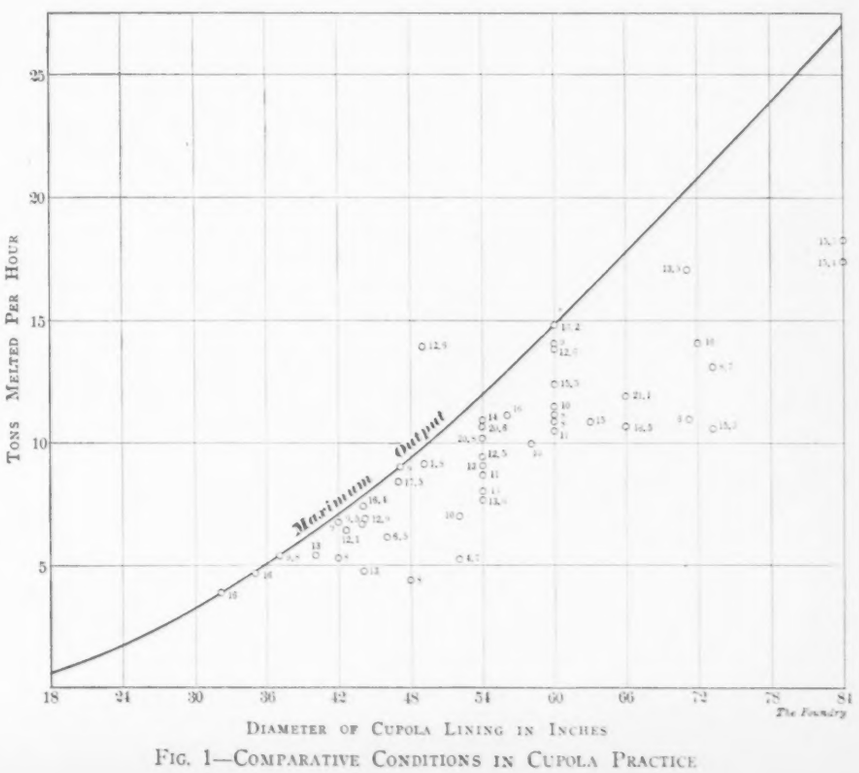



FIG. 1—COMPARATIVE CONDITIONS IN CUPOLA PRACTICE

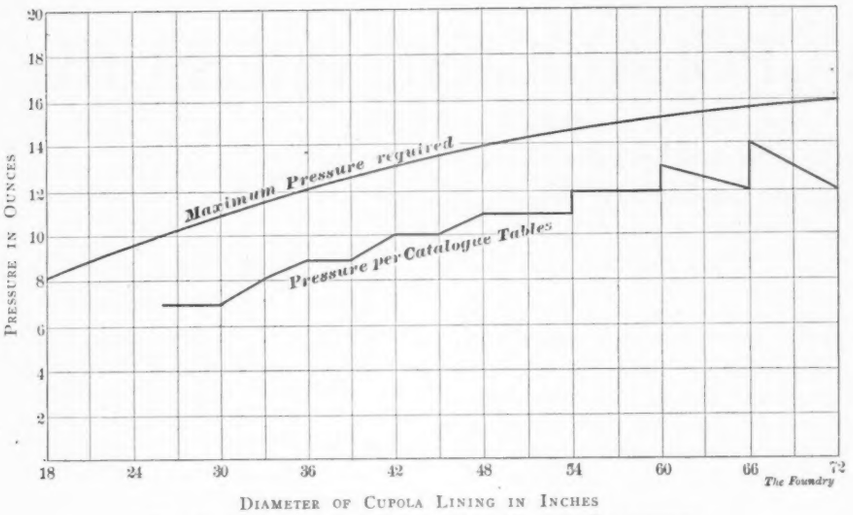



Fig. 2—Relations of Pressure to Cupola Diameters

of creating pressure high enough to force the air to the center of the cupola. But the diameter is only one of the factors in the creation of resistance; the height of the cupola with its contained charges presents a far greater distance through which the air must pass. Here it must continually meet resistance in constantly changing form, it must pass through tortuous channels, and its velocity to move a given weight must increase as the temperature is raised in the process of combustion. The operation is far more complicated than one would at first imagine, and it is one practically impossible of determination. Knowledge as to conditions within the cupola must therefore remain more or less inexact.

**Fan and Rotary Blower.**

Of course many cupolas are being operated at pressures exceeding those given in Fig. 2, but this is largely due to an improper combination of cupola and blower. By the nature of its design the pressure produced by a rotary blower runs up when increased resistance is imposed, while with the fan there is reduction in the volume delivered. Hence it is to be expected that with the rotary blower the pressure may frequently exceed that shown by the curve. But almost without exception this condition is unnecessary when the blower is properly proportioned to the cupola.

The curve is indicative of modern progress in the lowering of blast pressures and the use of large cupolas and blowers to secure the results previously sought by forcing those of smaller size.

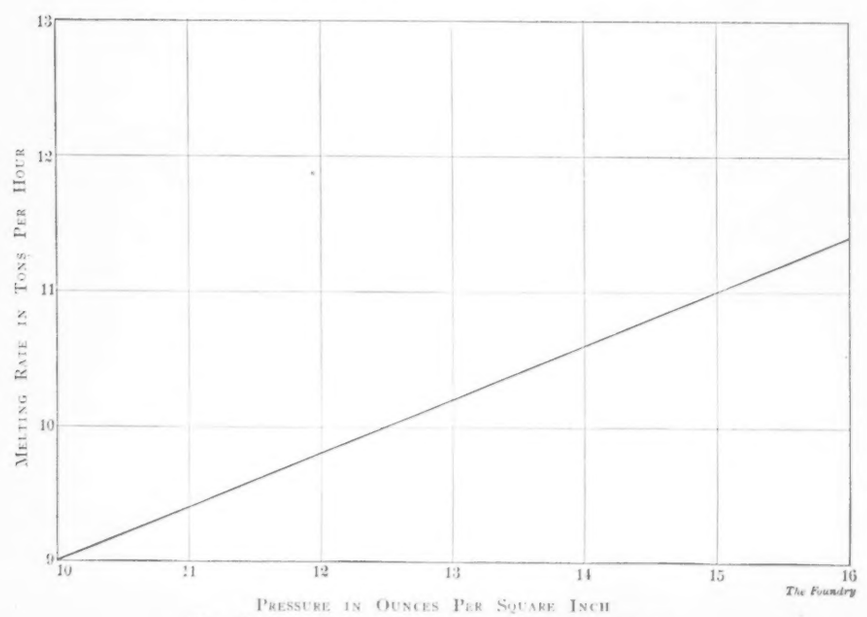



Fig. 3—Relation of Pressure to Melting Rate

When a cupola is forced through the medium of higher pressure the waste of power is out of all proportion to the increased capacity.

**Pressure and Melting Rate.**

The pressure determines the rate, which varies as the square root of the pressure. The curve in Fig. 3 clearly presents this fact. Here, for the sake of illustration, an output of nine tons per hour has been assumed for a given cupola, when operating at a minimum pressure of 10 ounces. The increase in capacity for any increase in pressure is shown by the curve up to 16 ounces, at which pressure the rate is only 11.39 tons, an increase of scarcely more than 25 per cent in capacity, corresponding to an increase of 60 per cent in pressure. Displayed in figures the capacity at 16 ounces was $\sqrt{\frac{16}{10}}$ equals 1.265 times that at 10 ounces. Inversely the pressure required to maintain a rate of 11.39 tons was $\left(\frac{11.39}{9}\right)^2$ equals 16 times that necessary to melt nine tons per hour.

At the same time the power was increased as the cube of the melting rate, i. e., it s $\left(\frac{11.39}{9}\right)^3$ equals 2 times that for the minimum output. For this it is evident that the power expenditure per ton per hour has increased 60 per cent.

The rapidly decreasing efficiency of a cupola under such conditions is evident. If a short, quick heat is absolutely necessary to give the greatest possible time for molding it had better be secured with a larger cupola, using lower pressure and requiring less power per ton of iron melted. Everything points toward the latter condition as the ideal to be sought in modern cupola practice. Not alone does it insure less wear and tear upon the blower, but it materially reduces the cutting effect upon the cupola lining and improves the general efficiency of the entire equipment. But only through new installations are such conditions likely to be attained. It is not an easy matter to substitute a larger for an inadequate equipment, and it is an all too frequent characteristic of human nature to hold to the old so long as it can be used. But a clearer perception of the advantage of a broader policy in the purchase of cupolas and blowers will eventually result in a definite improvement in foundry blower practice.

# MICRO-STRUCTURE OF FOUNDRY IRONS*

## An Exhaustive Discussion of the Action of the Metalloids on the Micro-Structure of Iron for Foundry Use

BY GEORGE HAILSTONE

IN PRESENTING the following paper, the writer wishes to point out that the reason for dealing with the two subjects, "The action of the metalloids on foundry irons" and "The micro-structure of foundry irons," is, that to thoroughly explain the one subject the other must be referred to. It also may be stated that the paper has been prepared from the foundryman's standpoint, and that the whole of the micrographs used to illustrate the paper have been prepared from the actual iron used or produced in a gray iron foundry.

When foundry or cast iron is in the liquid state it is considered to be a saturated solution of carbon, silicon, sulphur, phosphorus and manganese in iron, the percentage of carbon generally present being between 3.0 and 3.5 per cent. The total amount of carbon varies with the quantity and effects of the other elements present, some of which increase and others diminish the total quantity. Chromium and manganese increase the solvent power of iron for carbon; silicon and aluminum act in the opposite direction, and, therefore, diminish it. For example, a ferro-silicon containing about 14 per cent of silicon generally contains

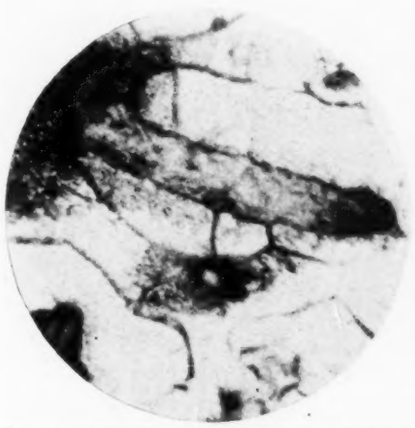


FIG. 2—CRYSTALS OF FERRITE THROUGH WHICH RUNS A LARGE FLAKE OF GRAPHITE

about 1.25 per cent of carbon, practically all of which is in the graphitic form. However, it is very unusual to meet with foundry irons containing less than 2 per cent, or more than 4 per cent of total carbon.

*Presented at the annual meeting of the Staffordshire Iron and Steel Institute.

### Carbon.

At one time carbon was supposed to exist in cast iron in only two forms, graphite as in gray iron, and combined carbon as in white iron. We are certain that carbon exists in gray iron as graphite, but the condition of the carbon in white iron is not thoroughly known. Probably some of the carbon exists as the carbide of iron $Fe_3C$, and some exists as a solid solution of carbon in iron.

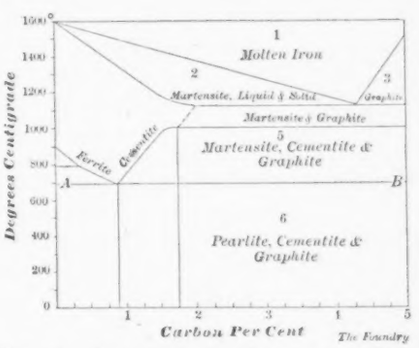



FIG. 1—CONDITION OF CARBON IN CAST IRON AT DIFFERENT TEMPERATURES

The conditions of the carbon in cast iron at different temperatures are indicated by the curve, Fig. 1. In the zone marked 1, above 1,130 degrees Cent., we have molten iron containing carbon in solution. In zone 2 we still have carbon in the liquid solution, but some solid solution of carbon in iron, which is called "Martensite," containing 2 per cent of carbon, has crystallized out. In zone 3 we have the iron with some of the carbon in solution, but the rest has separated out as graphite. In zone 4 we have martensite, or the solid solution of carbon in iron and graphite. If cast iron is kept for a long time at the temperature of this region, between 1,000 and 1,130 degrees Cent., the martensite becomes decomposed into ferrite and graphite, which is pure iron and pure carbon, but if sufficient time is not allowed the carbon will remain in solution as martensite. In zone 5 we have martensite and cementite, with some graphite, if the graphite has once been formed in zone 4, and iron and graphite if the carbon has been previously completely separated as graphite. In zone 6 we have a further change, pearlite being present, if sufficient time has been allowed for its formation at about 690 degrees Cent., being decomposed into cementite and ferrite. As superfusion plays a part in the above mentioned changes, we may get gray, ultra gray, mottled, or white cast iron from the same solution, according to the elements that are present. We have sulphur and manganese retarding the separation of graphite.

The effects of temperature on a No. 3 iron containing 2.5 per cent of silicon, and a No. 1 iron containing about 3.5 per cent of silicon may be stated thus:

No. 3 Iron—Owing to the slow cooling and the presence of silicon in zone 4 the change from martensite and graphite to martensite, cementite and graphite in zone 5 is largely prevented. It is possible that silicon has the power of decomposing martensite in zone 4, and this produces the stable condition of ferrite plus graphite. It may be suggested that silicon prevents super-cooling, and, therefore, assists in the separation of graphite.

No. 1 Iron—In the case of this iron the reactions referred to in No. 3 iron are complete. The martensite is completely decomposed, silicon being present in a larger quantity, and the counteracting elements, manganese and sulphur, practically absent. The conditions of slow cooling in zone 4 have been extended, and the conversion of martensite and graphite to martensite, cementite and

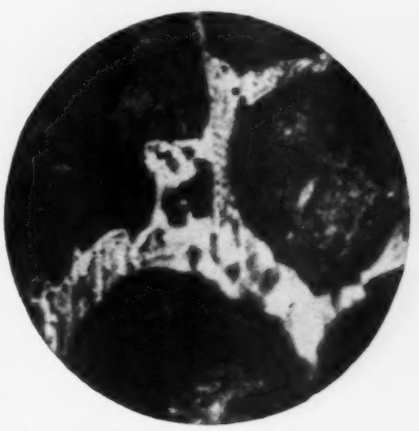


FIG. 3—A PORTION OF AN AREA OF CEMENTITE

graphite prevented. The stable condition of ferrite plus graphite has been attained.

The action of graphite on cast iron is to open the grain, weaken it, reduce shrinkage and chill, and indirectly soften it by being only mechanically mixed with

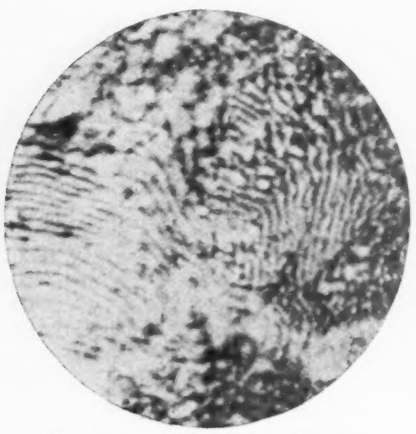


FIG. 4—STRUCTURE OF PEARLITE

it. Combined carbon closes the grain, increases the shrinkage and chill, and raises the strength.

**Si icon.**

This element may exist in cast iron as a silicide of iron, but this silicide appears to be in solid solution in the iron, forming crystals of the cubic system. On examining a micro-section of slowly cooled iron containing 3 per cent of silicon and only traces of the other elements, excepting carbon, which was in a normal quantity, the writer has seen what is believed to be crystals of this solid solution, to which may be given the name of "silicoferrite," side by side with crystals of normal ferrite.

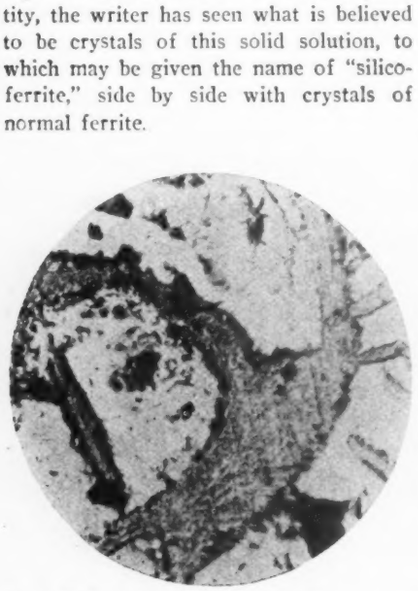


FIG. 5—LARGE AND SMALL FLAKES OF GRAPHITE IN A MATRIX OF FERRITE

Silicon may be said to act in three ways in cast iron:

1—By inducing the separation of graphite in large flakes.

2—By inducing the separation of graphite in very fine flakes.

3—By uniting with iron and manganese to form silicides, which tend to induce a large crystalline structure, and also increase the hardness and brittleness in proportion to the amount of silicon present. Silicon does not appear to be able to unite with carbon at the ordinary furnace temperatures.

In foundry practice there is a definite limit for the silicon contents of a gray iron casting. It should not contain less than 0.8 per cent, or more than 3 per cent of silicon. If it exceeds 3 per cent, then in thin castings the metal is apt to be overhard, and have a bright glossy fracture. On the other hand, when there is less than 0.8 per cent of silicon, even the thickest castings are too hard and are apt to be quite white and brittle, and also incapable of being manipulated in the ordinary way.

In Professor Turner's well known experiments, it is shown that the tensile strength of an iron is increased with every addition of silicon up to 2 per cent, and then the strength rapidly deteriorates with every increase of silicon. This is, however, only true with the certain iron that was experimented with. The writer has observed that with strong irons, prepared in the foundry for general use, the greatest strength is obtained with an iron containing from 1.25 to 1.50 per cent of silicon. It may be taken as a fixed rule that the lower the silicon, the weaker will small castings be, and the stronger the large castings; the higher the silicon in a small casting, up to 3 per cent, the stronger it will be, and the weaker the large casting.

The general effect of silicon upon cast iron is to increase the hardness, but as it induces the separation of graphite it acts indirectly as a softener. It also lessens shrinkage. By combining with any oxygen present it prevents blowholes. It increases the tenacity, but decreases the ductility.

**Manganese.**

The condition of carbon in cast iron being influenced by manganese is most likely partly due to its having the power to combine with carbon on its own account, therefore to increase the quantity of combined carbon in the iron. It also has an affinity for silicon and sulphur, which form manganese-silicide and manganese-sulphide, respectively, when the manganese is present in the quantity usually present in cast iron.

Manganese prevents the oxidation of iron when in the molten state; it also reduces any oxide that may be present in the iron, being itself more readily oxidized, and passing into the slag as manganese-silicate, hence the practice of allowing the white hot iron tapped from the cupola to stand for a time in the ladle before casting. The slag-forming tendency of manganese tends to produce basic slags, which are most favorable for the elimination of sulphur, for the more basic the slag the more completely will sulphur be removed. Manganese increases the shrinkage of cast iron, and

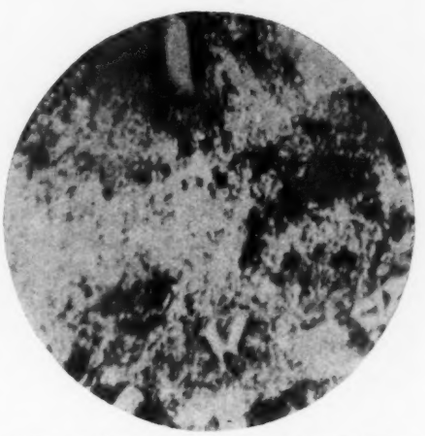


FIG. 6—CRYSTALS OF MANGANESE-SULPHIDE WITH A MATRIX OF PEARLITE

Keep has shown that an increase of 1 per cent of manganese, over the normal quantity usually present, will increase the shrinkage 26 per cent. In all probability this is due to the manganese retaining the carbon in the combined form. Manganese increases the hardness of cast iron enormously, this being advantageous in producing a hard chill. The physical properties of cast iron are not materially affected as long as the manganese present does not exceed 1 per cent. The amount generally present in cast iron is from 0.3 to 0.7 per cent.

To sum up, the effects of manganese

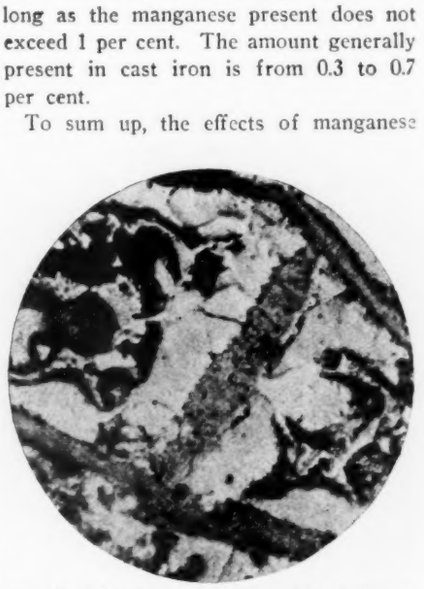


FIG. 7—MICRO-STRUCTURE OF NO. 1 FOUNDRY IRON

on cast iron are, to cause the carbon to remain in the combined form, and, therefore, increase the hardness and shrinkage; to prevent blowholes, by combination with any oxygen present; to produce a hard chill; to unite with sulphur, and

in this respect decrease the hardness; to form a basic slag, and thus partly remove the sulphur and phosphorus; to produce a close grain, and, therefore, a strong casting, and to increase the transverse strength.

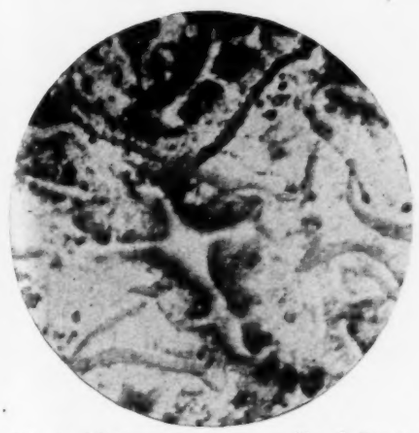


FIG. 8—MICRO-STRUCTURE OF NO. 3 FOUNDRY IRON

### Sulphur.

This element is not usually present in gray iron castings above 0.13 per cent, but when present, even in very small quantities, it exerts a very considerable influence on the properties of cast iron. Sulphur generally exists in the iron as a sulphide, and when manganese is present, which is nearly always the case with foundry irons, as manganese-sulphide, having the formula MnS. When these elements occur in atomic proportions they completely neutralize each other; on the other hand, if either is in excess they form manganese-carbide or ferrous-sulphide as the case may be. Iron-sulphide

FIG. 9—MICRO-STRUCTURE OF NO. 6 FOUNDRY IRON

being readily fusible, and also decomposing at high temperatures, a large proportion of the sulphur escapes as a gaseous compound, giving the metal a spongy texture. As stated, when manganese is present the sulphur appears to unite with it in preference to iron, and as manganese-sulphide has a high melting point, and also a high dissociation point, the sulphur is not then liberated in the gaseous form, so that blowholes and red shortness are, to a certain extent, avoided.

In making micrographic analyses of cast iron, the writer has observed that when the sulphur has been below 0.11 per cent, the manganese-sulphide has always been found in the carbide of iron or cementite, but when the sulphur has been found to be above 0.11 per cent, some of the manganese-sulphide is found in the pearlite.

### Influence of Sulphur.

The tendency of sulphur is to neutralize silicon. It acts similar to manganese in keeping the carbon in the combined form. Sulphur generally increases in iron as silicon diminishes. As sulphur exists in cast iron, when there is not enough manganese present to neutralize it, as a moderately fusible sulphide, it is liable to remain in the liquid form after the mass of metal has become solid, and tends to segregate in the middle and upper parts of a cooling casting.

The quantity of sulphur that may be allowed in a casting entirely depends upon the silicon present, and for a soft casting should not exceed 0.07 per cent. In strong castings, such as cylinders, it has been found that to have about 0.11 per cent of sulphur present, the greatest wearing properties are obtained, the injurious effect on the strength being amply compensated by the additional wearing properties the casting will have.

The general effects of sulphur on foundry irons may be summed up as follows: It makes iron more fusible and liquid by the formation of a fusible sulphide; as sulphur tends to the formation of combined carbon, the iron is harder and the shrinkage is increased; with much sulphur, and the absence of manganese, and a high casting temperature, sulphur causes blowholes; because of combined carbon sulphury irons produce a deep chill; as segregation occurs, and blowholes and fusible sulphides are formed, all of which produce inter-crystalline weaknesses, sulphur tends to diminish the strength of cast iron.

### Phosphorus.

This element exists in foundry irons as a fusible phosphide having the formula $Fe_3P$, which contains 15 per cent of phosphorus. Practically the whole of the phosphorus in an ore charged into the blast furnace passes into the metal produced. Phosphorus has little direct influence on the condition of the carbon in cast iron. Phosphide of iron is very hard, but not as hard as carbide of iron. It is found associated with the carbide of iron or cementite. Upon examining an iron containing phosphorus under the microscope, the phosphorus compound is found in the cementite in the form of streaks and dots.

Phosphorus increases the fluidity of cast iron considerably, hence the use of highly phosphoric iron for fine castings,

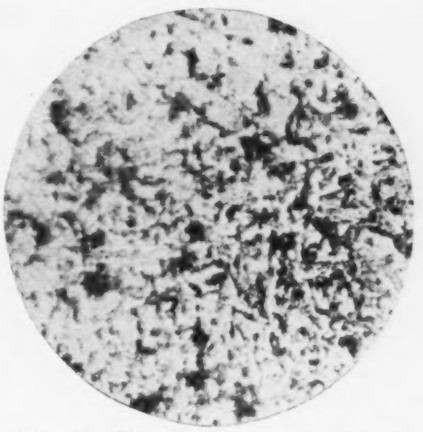


FIG. 10—MICRO-STRUCTURE OF SEATON CAREW HEMATITE IRON

where the strength is only a secondary consideration. As the phosphide of iron, having a freezing point of about 900 degrees Cent., remains fluid after the main bulk of iron has solidified, an excess seems to have a mechanical influence upon the cementite, by causing it to run in nearly straight lines throughout the casting, thus forming lines of weakness, and, therefore, making the iron more brittle and more easily fractured under impact.

The presence of phosphorus lowers the percentage of total carbon, and this effect increases proportionally with the increase of phosphorus. With 2 per cent

FIG. 11—MICRO-STRUCTURE OF NO. 4 FOUNDRY IRON

of phosphorus in pure cast iron there is not more than 2 per cent of carbon.

For strong castings, phosphorus should not exceed 0.6 per cent, and when the amount exceeds 1.5 per cent the iron becomes very weak and hard.

To sum up briefly, the effect of phosphorus on cast iron is to make the metal harder, more fusible, whiter, more fluid and weak; it prevents blowholes and lessens shrinkage.

**Microstructure of Foundry Irons.**

As a section of iron to be examined micrographically needs special prepara-

FIG. 12—MICRO-STRUCTURE OF SILICIOUS PIG IRON

tion, perhaps it will be as well to explain the method used in obtaining the micrographs used in this paper, before dealing with them.

The samples of cast or pig iron as the case may be, are either cut in a lathe, or by filing in a vise, or by other means according to circumstances, to a suitable size. A very convenient sized section is one about ½ inch in diameter and 1/10 inch thick.

The face of the section to be examined is filed with a dead smooth file, and the edges slightly beveled to prevent it

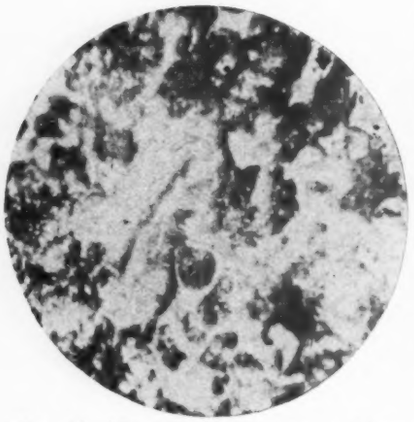


FIG. 13—MICRO-STRUCTURE OF A VERY LIGHT CASTING

injuring the polishing pads. When all the file marks are running in the same direction the section is rubbed at right angles to the file marks on a piece of emery cloth that has been stretched upon a piece of smooth hard wood. Again, when all the marks made by the emery cloth are in the same direction, and the whole of the file marks have been removed, the section is reversed and rubbed on various grades of fine emery cloth, reversing the section each time the paper is changed.

The section of iron is then rubbed, at right angles to the scratches, on a piece of wash leather, covered with the finest rouge, stretched on a piece of wood, until the section is free from scratches.

**Developing the Structure of Iron.**

In order to develop the structure of cast iron, the polished surface of the section is subjected to the action of various reagents, such as dilute nitric acid, iodine solution, and 5 per cent solution of picric acid in alcohol, to reveal the various constituents.

The method adopted by the writer is as follows:

The polished surface about to be examined is rubbed on parchment stretched upon a piece of sheet glass, which has been previously moistened with a 5 per cent solution of iodine in alcohol, for two or three minutes.

The section is then washed with a few drops of alcohol, and then gently warmed to dry. It is then finally rubbed a few times very lightly on the rouged wash leather pad again. The specimen, with the exception of mounting, is now ready for examination by the microscope.

It often happens that the sections of iron are not regular in shape, and the polished surface is not parallel with the opposite sides. As the preparation of pieces of regular thickness involve the loss of time, as in the case of a piece of white iron, and also as it is generally only one flat surface that is required, it is necessary to mount the irregular shapes of metal on the glass microscopical slide so that the polished surface of the section is always parallel with that of the microscopic slide.

Metallic sections, being opaque, cannot be examined by transmitted light consequently special illuminating apparatus has to be used. The illumination used for all the sections shown is vertical. This is produced by having a hole in the microscope tube, just above the objective, and a right-angled prism placed in it in such a position that it reflects any light which passes on to it, through the hole, down on to the section, which is then transmitted up the tube of the microscope. A Welsbach gas burner may be used as a source of illumination for both examination and photographing. Between the source of light and the prism illuminator a bull's-eye condenser should be placed to concentrate the rays.

**Micro-Photography.**

There are many forms of cameras made for micro-photography, some working in horizontal and others in vertical positions. The camera with which all the micrographs that follow were taken was of the horizontal type.

In taking a photograph, the object should be first carefully focussed under the microscope in the ordinary way, and without removing the eyepiece, the hood

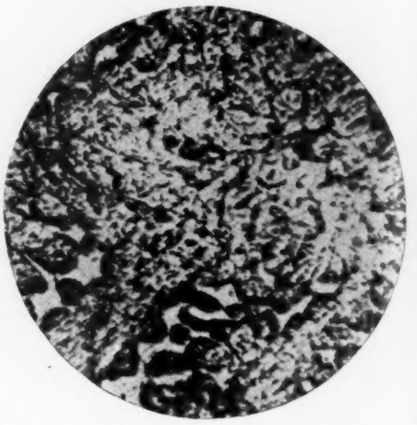


FIG. 14—MICRO-STRUCTURE OF A CASTING CONTAINING 2.316 PER CENT SILICON

of the camera pushed over the latter, and the camera extended to give the required magnification.

The time exposure depends upon the magnification required, the source of illumination, and to a great extent upon the object. For an ordinary gray cast iron, with a magnification of 250 diameters, the source of illumination being an incandescent burner, the exposure required in about 20 minutes. A magnification of 50 diameters requires about 10 minutes under the same conditions. The

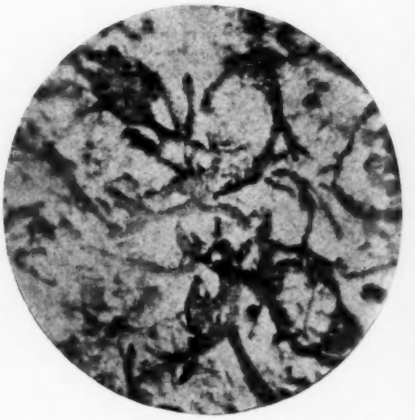


FIG. 15—MICRO-STRUCTURE OF A SOFT CASTING

photographic plate after being exposed is developed in the ordinary way.

There are six micro-constituents generally observed in gray foundry irons, as follows: Ferrite, cementite, pearlite,

graphite, phosphide of iron or phosphorus eutectic, and manganese sulphide.

Ferrite is pure iron, sometimes it occurs in crystals that are readily recognized, but more often than not as a white groundwork or matrix. Being unstained by the etching liquid that is used to reveal the various constituents, it remains white. Silicon and manganese are present in the ferrite, and as they are isomorphous with the iron they often replace some of the crystals of ferrite. Ferrite is the softest constituent of cast iron, excepting graphite. The micrograph, Fig. 2, shows crystals of ferrite, through which runs a very large flake of graphite.

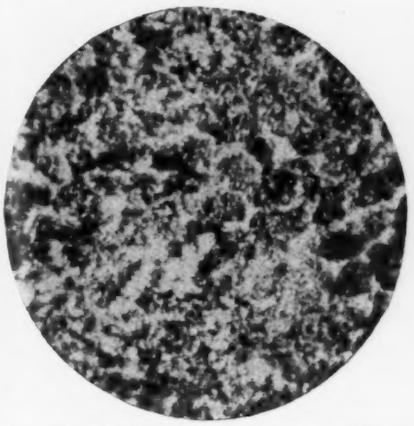


FIG. 16—MICRO-STRUCTURE OF A STRONG CASTING

### Cementite.

Cementite is a chemical compound of carbon and iron containing 6.6 per cent of carbon, corresponding to the formula $Fe_3C$. The iron is sometimes replaced in this constituent by the other metals associated with the iron. For instance, we get double carbides of iron and manganese. Cementite is the hardest constituent of cast irons. It resembles ferrite inasmuch as it is not stained by the etching liquid, but being very hard it stands up in relief after polishing, and is, therefore, readily distinguished. Fig. 3 clearly shows a portion of an area of cementite, the black portions in the cementite being the phosphorus compound.

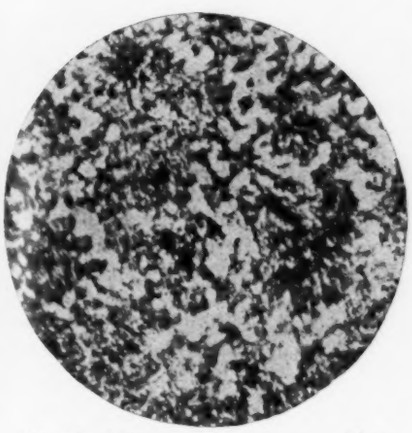


FIG. 17—MICRO-STRUCTURE OF A HIGH PHOSPHORUS IRON

### Pearlite.

Pearlite is a definite mixture of ferrite and cementite. Pearlite contains 0.89 per cent of carbon or 13 per cent of cementite. Its typical formula is 21 Fe + $Fe_3C$. The carbon in pearlite is molecularly associated with only about 12 per cent of the iron, 87 per cent of the latter being in the free state. Pearlite is recognized by its characteristic striated structure, consisting of alternate laminae of ferrite and cementite. It is colored dark by the etching liquid, and when the specimen is a good one it has a very beautiful mother-of-pearl appearance.

As ferrite and cementite, when in segregated patches are not colored by the etching liquid, the question may arise, how is it that pearlite is? The explanation of this may be that, on polishing, as the cementite is the harder constituent, the ferrite is rubbed away much more easily, and, therefore, the cementite stands up in relief. When the etching liquid is put upon the specimen, some of it falls into the recesses formed by the rubbing away of the ferrite and is not completely removed in the final polishing, also as cementite stands up above the ferrite, shadows are formed, and, therefore, we get this peculiar striated appearance. Fig. 4 shows the structure of pearlite, the light portion being the cementite and the dark portion the ferrite.

### Graphite.

Graphite is practically pure carbon in the free state; it occurs in cast iron in varying sized flakes, from very large to very small. Fig. 5 shows large and small flakes of graphite in a matrix of ferrite.

The phosphorus compound was shown in Fig. 3, its composition corresponding to the formula $Fe_3P$. It is always found associated with the cementite, with which it forms a eutectic, and is characterized by the form it takes, like so many streaks and dots.

Manganese-sulphide occurs in square or oblong shaped crystals of a gray color. It sometimes occurs in the cementite and sometimes in the pearlite, according to the amount of sulphur present. Fig. 6 shows two crystals of manganese-sulphide with a matrix of pearlite. Manganese-sulphide corresponds to the formula of MnS.

Fig. 7 shows No. 1 iron. It will be seen that the structure of this iron consists of large flakes of graphite in a matrix of crystals of ferrite. The chemical analysis of this iron is, graphite, 3.27 per cent; combined carbon, 0.050 per cent; silicon, 3.25 per cent; sulphur, 0.045 per cent; phosphorus, 0.40 per cent; manganese 0.78 per cent.

Fig. 8 is a section of the No. 3 iron. It will be readily seen here that the flakes of graphite are much smaller and thinner than in the previous section, also that there is an area of cementite in the center of the section, the main groundwork or matrix still being ferrite. The chemical composition of this iron is as follows: Graphite, 3.130 per cent; combined carbon, 0.25 per cent; silicon, 2.35 per cent; sulphur, 0.058 per cent; phosphorus, 0.40 per cent; manganese 0.75 per cent.

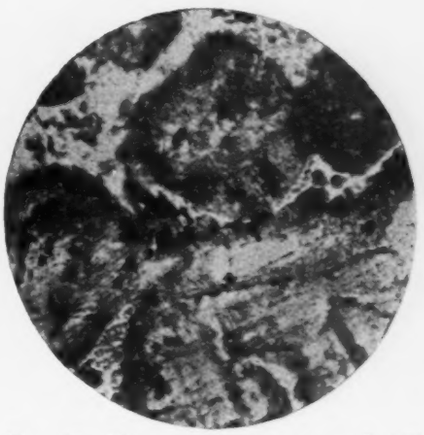


FIG. 18—MICRO-STRUCTURE OF A LARGE WHEEL CASTING

Fig. 9 shows the structure of the No. 6 iron. It will be seen that the structure of this iron is entirely different from the Nos. 1 and 3, consisting of small thin flakes of graphite, in a matrix of pearlite, in which there is an area of cementite. The composition of this iron is: Graphite, 2.25 per cent; combined carbon, 0.75 per cent; silicon, 1.580 per cent; sulphur, 0.100 per cent; phosphorus, 0.39 per cent, and manganese, 0.75 per cent.

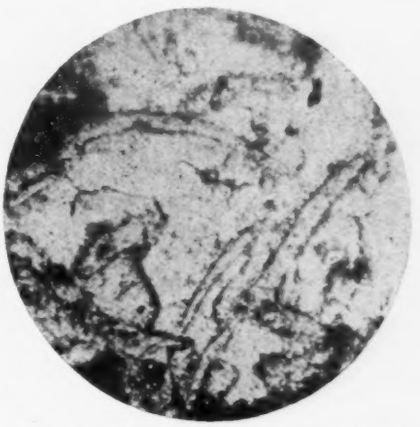


FIG. 19—MICRO-STRUCTURE OF A HIGH SILICON CASTING

Fig. 10 is a section of Seaton Carew Hematite, containing the following: Graphite, 3.125 per cent; combined carbon, 0.338 per cent; silicon, 1.076 per cent; sulphur, 0.057 per cent; phosphorus, trace; manganese, 0.874 per cent. In this section the graphite, cementite and pearlite are very intimately associated with each other. The appearance of the structure shows it to be a strong iron.

Fig. 11 is a section of Clay Cross pig iron No. 4, containing silicon 1.332 per cent, sulphur 0.069 per cent, phosphorus 1.501 per cent. Here the graphite is in very small flakes in a matrix of ferrite, in which is intermixed areas of cementite containing the phosphorus eutectic. The appearance of this structure denotes that this iron is of a weak, brittle nature.

Fig. 12 is a section of silicious pig iron, containing graphite, 3.860 per cent; combined carbon, trace; silicon, 4.359 per cent; sulphur, 0.030 per cent; phosphorus, 1.122 per cent, and manganese, 0.372 per cent. Here we find long flakes of graphite in a matrix of ferrite, intermixed with areas of the phosphorus compound. This iron is very weak, owing to the large percentage of graphite and silicon.

**Micro-Photographs of Castings.**

Fig. 13 is a section from a very light casting containing graphite, 3.103 per cent; combined carbon, 0.216 per cent; silicon, 2.693 per cent; sulphur, 0.068 per cent; phosphorus, 1.020 per cent; manganese, 0.610 per cent. The light portions of the section are the cementite, and the dark portions graphite and pearlite.

Fig. 14 is a section from a casting containing, graphite, 2.400 per cent; combined carbon, 0.586 per cent; silicon, 2.316 per cent; sulphur, 0.123 per cent; phosphorus, 0.960 per cent; manganese, 0.356 per cent. A transverse test bar cast from this metal, 2-inch by 1-inch by 3-feet centers, broke at 3,400 pounds, with a deflection of ⅝-inch. It will be seen that in this section the graphite is in very small flakes in a matrix of ferrite and pearlite, also that the areas of cementite are very small.

Fig. 15 is from a medium sized soft casting, the composition of it being, graphite, 2.500 per cent; combined carbon, 0.589 per cent; silicon, 2.167 per cent; sulphur, 0.123 per cent; phosphorus, 1.150 per cent; manganese, 0.533 per cent. This section shows clearly medium sized flakes of graphite, which is really in a matrix of pearlite, but the section has been polished well to bring out the flakes of graphite.

Fig. 16 is a section from a strong casting. The transverse strength of the 2-inch by 1-inch bar gave 3,700 pounds, with a deflection of ½-inch. The composition of this iron is, graphite, 2.630 per cent; combined carbon, 0.583 per cent; silicon, 1.547 per cent; sulphur, 0.117 per cent; phosphorus, 0.768 per cent; manganese, 0.497 per cent. Here the graphite, cementite and pearlite are very intimately mixed; this is an ideal structure of a strong iron.

Fig. 17 is a section of a high phosphorus iron, also fairly high in silicon. This metal is good for casting a large bulk of metal, where strength is only of a secondary consideration, the high phosphorus giving it a low casting temperature and the silicon promoting the formation of graphite; thus sinking is overcome. The composition of this iron is, graphite, 2.500 per cent; combined carbon, 0.291 per cent; silicon, 2.549 per cent; sulphur, 0.062 per cent; phosphorus, 1.895 per cent; manganese, 0.642 per cent. The micro-structure shows that graphite and ferrite are in the matrix, the white portion being the phosphide of iron.

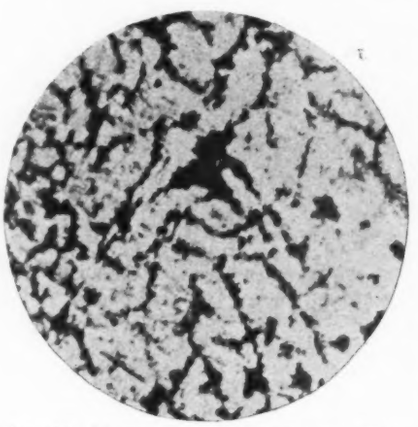


FIG. 20—MICRO-STRUCTURE OF IRON TAKEN FROM AN OLD ANNEALING POT

Fig. 18 is a section from a heavy wheel containing, graphite, 2.720 per cent; combined carbon, 0.422 per cent; silicon, 1.478 per cent; sulphur, 0.071 per cent; phosphorus, 1.335 per cent; manganese, 0.591 per cent. This section shows very clearly the graphite, pearlite, cementite, and phosphorus eutectic.

Fig. 19 shows the effect of using an iron too high in silicon for a large casting. The flakes of graphite being too large, also there are large crystals of ferrite, the boundaries of which form lines of weakness. This iron is of the same analysis as Fig. 14, which has been used for the right sized casting.

Fig. 20 is a section of cast iron from an old annealing pot, which has been burnt. All the graphite has been oxidized. This iron is full of cracks containing oxide of iron, thus it can be readily seen that it is useless to use up in the cupola again.

From the foregoing I think you will agree how absolutely necessary it is that the modern foundry manager who wishes to attain the greatest possible measure of success, by the avoidance of the production of unsuitable castings required for various purposes, should have some knowledge of the chemical and microscopical constituents that enter into the composition of the various irons used in his mixtures, not relying, as many founders do, at the present time, on the old-fashioned, time-honored, but oft misleading judgment by "fracture."

---

An interesting lesson in economy is contained in a recent publication issued by the Electric Controller & Supply Co., Cleveland, O., concerning the uses of its line of powerful lifting magnets. The publication relates that a steel foundry, where one of the magnets was in use, recently received a car for loading purposes which had been used for shipping pig iron. A magnet used in the company's yard was lowered to within three inches of the car floor and swept over its surface. It picked up over 600 pounds of pig iron chips and dust which were loaded into a charging box. With pig iron at $20 a ton, which was then the prevailing price, the company figured that it had been presented by some one with $6 worth of iron.

---

## THE CIRCULAR SAW AS A CORE-BOX MACHINE.

BY F. WEBSTER

When constructing large core boxes where the cylindrical surfaces are built up of staves, the curved form can be given to these by using a circular saw. There are regular core box machines for this purpose, but many pattern shops do not have these. Most shops, however, have some form of circular saw bench. Thus, suppose that the surface of a half box is made up of six staves as shown in Fig. 1. A full sized sketch should be made of the layout, as this method will enable the patternmaker to get the correct bevel and all the dimensions of the stock for the staves.

Now, if the diameter of the finished box happens to be the same as that of the circular saw available, then the

excess stock can be removed from the inner surface, as shown in Fig. 2. Elevate the saw until the top projects above the table a distance about equal to the length of the teeth. Then place the stave with the narrow edge

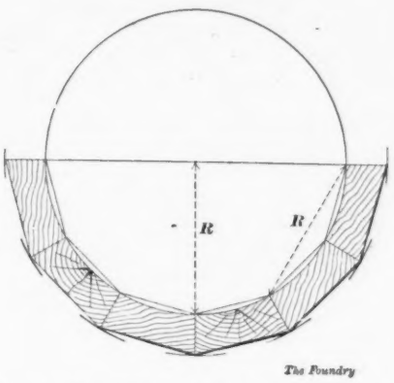



FIG. 1—SURFACE OF HALF CORE BOX MADE UP OF SIX STAVES

flat on the table, and the end of the stave flat against the side of the saw as shown. Set the guide along the stave, and feed the stave endwise across the revolving saw. If the groove is not made deep enough at the first operation, the saw is raised an additional height, not exceeding that of a tooth length, and the operation repeated until completed. It will

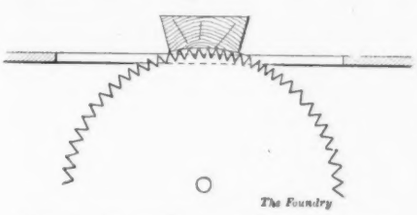



FIG. 2—REMOVING THE EXCESS STOCK FROM THE INNER SURFACE

be noted that his gives a concave surface of the same diameter as the saw.

Where the box is to be less in diameter than that of the saw, then the staves must be fed across the saw at an angle, as shown in Fig. 3. The method of finding the angle from setting the guide will be understood by referring to Figs. 4 and 5. In Fig. 4 one of the required segments is shown placed on the circumference for the core box, and in Fig. 5, the size of the saw is given, and the layout for the angle to locate the stave across the saw shown. If three staves are used for the half box, then the width of the inner edge of each one is the same as the radius of the circle; that is, *ab* of Fig. 4 is the same length as R. The depth *d*, Fig. 4, of the arc of the

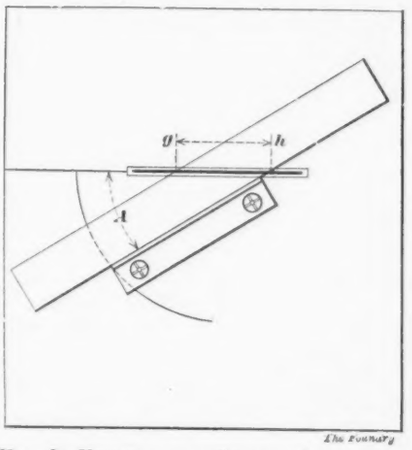



FIG. 3—FEEDING THE STAVES ACROSS THE SAW AT AN ANGLE

excess stock to be removed is laid off at D on the radius of the circle of the saw in Fig. 5, and the line *st* is drawn to form a chord of the circle that represents the saw. Then with a radius P equal to the width of the inner edge *ab* of the segment, and with the end *s* of the chord as a center, describe the arc *mn*. From the point *t* draw a line *tl* tangent to the arc *mn;* that is, so that it just comes in contact with it, and the angle *A* will be that required for the guide, as shown in Fig. 3, in order to cut the proper arc in the staves. The point of contact of the tangent *tl* on the arc *mn* is shown at *k*. It will be noticed in Fig. 5, that the line *st* is the width of the part of the saw above the table, and corresponds to the line *gh* in Fig. 3. Also, the distance D is the amount that the saw projects above the table when taking the finishing cut for

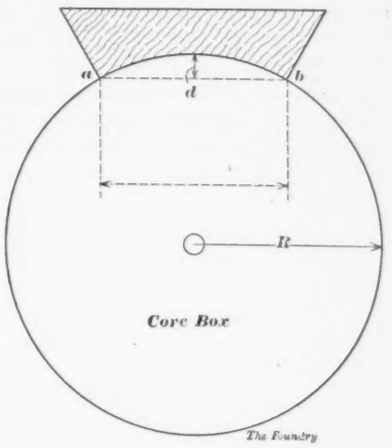



FIG. 4—METHOD OF OBTAINING AN ANGLE BY USE OF THE GUIDE

the groove. The width of the stave in Fig. 3 corresponds to *ab* in Fig. 4, and P in Fig. 5. After getting the angle, and

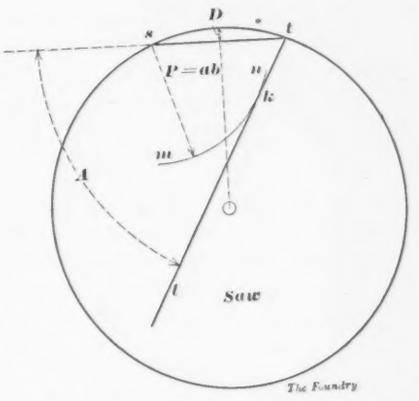



FIG. 5—LAYOUT OF ANGLE TO LOCATE THE STAVES ACROSS THE SAW

raising the saw the depth of the teeth above the table, set the guide to the angle *A*, and feed the staves across the saw as shown in Fig. 3.

# CONVERTER VERSUS THE SMALL OPEN-HEARTH—V

BY W. M. CARR

FOR AN average output of about 12 tons of castings daily, the following equipment will be needed to deliver steel in readiness to pour into molds. In regard to molding, core making, cleaning, etc., the equipment will be the same in both steel-making methods, differences occurring only in the style of apparatus to produce molten steel.

To keep the output steadily at the quantity mentioned, it is recommended that three converters be erected, two of them can be in operation with one in reserve or in repair. One will turn out the required tonnage, but to be prepared for emergencies it is better to have the number mentioned.

The melting equipment can consist of one or two 40-inch cupolas capable of melting about four tons of a mixture of pig iron and steel scrap per hour. The cupola charges may be handled in the same manner as in a gray iron foundry.

Blast for the converters should be generated by a positive blower delivering air

at a pressure of about four pounds per square inch, at a volume of about 880 cubic feet per minute, per ton of charge treated. In addition there will be the usual fan blower to serve the cupolas. The mechanism to tilt the converters may be operated by hand or power, preferably power.

There should be at least one lip pour ladle of about two tons capacity besides a number of hand ladles of different sizes. Provision must be made to strongly preheat all ladles and for the purpose it is recommended that oil burners be employed. The same means can be used to pre-heat the converters, since oil is more effective than coke. The non-conducting disadvantage of ashes will be obviated.

For transferring the molten iron from the cupola to the converter and for pouring the steel from it into molds there should be an overhead crane of at least 10 tons capacity.

### Cost of Equipment.

The cost of the equipment can be summed up as follows:

| | |
|---|---|
| Two 40-inch cupolas, fully lined, @ $500 | $1,000 |
| Three two-ton, side-blow converters @ $1,500 | 4,500 |
| One positive blower | 1,000 |
| One fan blower | 150 |
| Ladles, two-ton capacity and smaller | 400 |
| Approximate cost of steel making devices | $7,050 |

In addition to the foregoing there will be, of course, buildings, power, machinery, molding and core-making facilities, drying ovens, sand mills, cold saws, oil storage tank, etc., bringing the total cost to about $18,000, depending upon the character of the buildings and equipment. The writer has been informed that a single converter plant in wooden buildings cost complete only $10,000.

### Approximate Cost of Open-Hearth Installation.

In Germany it is stated that small open-hearths with capacities as small as 500 to 1,000 kilograms (1,220 to 2,240 pounds) per heat have been in operation for over 30 years. They were built in such sizes that the capacity could be readily increased to double the rate of the smaller tonnage. To illustrate, in addition to the size mentioned the units ran as follows:

1,000 to 2,000 kilogram per furnace.
1,500 to 3,000 kilogram per furnace.
2,000 to 4,000 kilogram per furnace.

As a kilogram is equivalent to 2.24 pounds, the tonnage of the last and largest furnace was 8,960 pounds, approaching in size the smallest furnaces in operation in the United States of five tons capacity. It is further stated that the costs of construction for the five sizes were $2,550, $2,925, $3,650 and $4,325, respectively, and the costs of steel in the ladle ranged from $2.54 to $2.10 per 100 kilograms, as against $3.55 per 100 kilograms for steel in the ladle produced by small converters. The furnaces were acid lined and the fuel producer gas.*

### Cost of Small Open-Hearth.

While there is no technical objection to building an open-hearth as small as two tons capacity per heat, the question of economy has to be considered. The skilled labor will be the same cost per day in any size suited to the production of castings, but the cost per ton of output will vary with the size of the furnace. This point is self-evident and needs no elaboration. The size of the furnace desired will depend upon the demand and other conditions. Since a furnace of five tons capacity capable of yielding four heats per 24 hours is of a convenient size, the following figures will represent the approximate cost, erected within a radius of miles from the Pittsburg district:

### Cost of a Five-Ton Furnace.

Prices represent furnace structure, including brick work (refractory and red) structural steel binding, iron castings, reversing valve, self-sustained stack (steel brick lined) and all foundations, but does not include cost of charging platform:

| | |
|---|---|
| Brick work | $1,357 |
| Steel stack | 600 |
| Iron castings | 500 |
| Steel binding (erected) | 1,200 |
| Bolts and washers | 240 |
| Reversing valve | 400 |
| Foundations (excavating and concrete) | 690 |
| Oil tank and pump | 500 |
| Oil burners for furnace and ladle drying | 200 |
| Two five-ton ladles | 450 |
| Total cost of furnace ready for bottom | $6,137 |

The foregoing cost applies to either an acid or basic structure and if basic should be the practice selected there would be an increase of about $200 for bottom making material.

### Other Equipment.

In regard to other equipment needed to produce saleable castings, the items will be the same as in a converter plant of equal capacity, excepting that there is no machinery required about an open-hearth furnace and, therefore, such parts as positive blowers and fans are not required. The floor space within the buildings may be larger with an open-hearth since it will occupy an area of about 30 x 15 feet. The furnace may be elevated above the molding floor with the charging floor at a distance of 8 to 10 feet above, or the furnace may be depressed so that its charging floor will be level with the foundry floor.

*Stahl und Eisen*, Vol. XXIV, page 347.

# CHEMICAL REACTIONS IN CUPOLA PRACTICE*

BY JULES DeCLERCY

FEW PROCESSES recently developed for obtaining motive power through the agency of gas engines driven with producer gas, have led engineers to give more attention than they had done heretofore, to the complicated chemical reactions taking place at different levels, in a large mass of incandescent fuel, under varying conditions. The results observed in the course of these experiments, apply exactly to the conditions existing in the operation of foundry cupolas. These conditions, as a matter of fact, are absolutely similar to those existing in coke or anthracite producers, considered as burning their own gas, instead of delivering it to a gas engine.

### Reaction in the Gas Producer.

Let us first see what takes place in one of these producers, when run with a dry air blast. The incoming air, blown in through the tuyeres, or under the grate (which is the same thing) first meets a mass of previously heated incandescent coke. The oxygen of this air, combines at first with the carbon of the coal or coke to form carbonic acid gas, as a result of the complete combustion of the coal or coke. This reaction is expressed by the following chemical equation:

$$C + 2\,O = CO_2.$$

This means that the oxygen of the air combines with its equivalent to form a volume of carbonic gas equal to its own. In other words, that 32 ounces of oxygen, calling for approximately 140 ounces of air, combine 12 ounces of carbon, to form 44 ounces of carbonic gas. One pound

*Presented at the annual meeting of the American Foundrymen's Association.

of carbon burning in this manner, develops 14.500 B. T. U.

The greater part of this heat is carried upwards by the gases of combustion and goes to heat the upper layers of fuel in the producer (or the layers of iron above, in the case of the cupola).

### Reactions in the Cupola.

Let us now consider what actually takes place in an ordinary foundry cupola. In this case, the temperatures are much higher; there is no fear of destroying the linings, or rather, it is a necessary and unavoidable evil, and the inconvenience of obstructions caused by clinkers is done away with by making the blast sufficiently powerful to either go through or around them. Moreover, the iron being a base and largely in excess as compared to the acid silica, the silicates produced are more fusible than those met with in gas producers; the temperature being also very high, these silicates run quite freely with the iron on to the sand bottom of the cupola. If necessary, this fusion is assisted by the addition of fluxes to the iron.

These scoria are particularly abundant in the neighborhood of the linings which eat away and destroy quite rapidly. If the blast is a powerful one, the cold air coming in at the tuyeres, having a tendency to follow the line of least resistance, runs up along the sides of the cupola, cools them down around and above the tuyeres, and so sets or hardens the scoria coming down along the walls from the upper layers of the melting zone. From that time on, a rim of hardened scoria forms around the tuyeres and especially above them; this rim or cushion keeps on increasing in size, until it eventually stops the action of the cupola altogether.

### Action of Air Upon Coal in the Cupola.

If the cupola has only one row of tuyeres and the fuel is in small pieces, the action of the air upon the coal will be absolutely the same as in the producer; a great excess of carbon monoxide will be formed, and about two-thirds of the heat actually available in the coal or coke will go out through the stack without having been turned to any use. If these gases were drawn off at the level of the charging door and sent into a gas engine, the hour-horsepower could be obtained from 160 cubic feet of it. Now, as one pound of carbon, burned to carbon monoxide, yields 80 cubic feet of gas, it can readily be seen that for every pound of coke or coal burnt, an extra half horsepower-hour could be produced and saved.

### Waste Heat in the Cupola.

This is just what is now being often done in modern blast furnaces. In the case of cupolas, however, it cannot be done, and the loss and consequent waste of this heat is apparently beyond remedy. It is not the only loss made, either. The heat to melt the iron must be developed in any event, which means that 3¼ pounds of coke must be burnt for every pound put to effective use. On the other hand, seeing that it takes only half as much air to burn carbon to CO as it does to burn it to $CO_2$, it will readily be understood that ½ x 3¼ or 1.60 volumes of air will have to be blown into the blast to transform the coke into carbon monoxide, as compared to one volume only required to burn the fuel to $CO_2$. This is an increase of 60 per cent required in the supply of air, which means a corresponding increase in the power required to drive the blower, whenever combustion to CO is going on. This, of course, is an illustration of an extreme case, because it is impossible to make carbon monoxide alone, without making at the same time a certain proportion of carbonic gas.

This carbon monoxide may be seen burning as it passes the charging door where it finds the air required to burn it; or else, whenever the draft is weak, the gas not finding sufficient air in the stack, burns only at the top, where it bursts into a large sheet of flame. The above remarks are sufficient to show that the running of cupolas in this manner must be considered as an entirely unsatisfactory operation in every respect.

### Fuel Combustion.

To secure more complete combustion, the blast is sometimes increased at a higher cost of power. If the fuel contains small pieces, and especially when it is coke alone that is being used, this remedy has no useful effect. If the coke is large, the air rushing more rapidly through the interstices, has no time to react as completely at the level of the tuyeres, there is less formation of carbon monoxide, and the efficiency of the combustion is improved somewhat. But the slag is cooled down to a great extent by the incoming air, especially around the tuyeres, where it causes the formation of a cushion of solidified slag around and above them. Moreover the general result is to produce uneven temperatures causing oxidation of the iron and produces castings that are brittle and hard to work.

### Use of Anthracite.

If large size anthracite is being used, the reduction of the gases is still less rapid than with coke, and especially with light porous coke, because the surfaces exposed to the action of the air are much smaller in the case of the coal than in that of the porous coke. That is the reason why, in certain cupolas having only one row of tuyeres, better results will often be obtained with homogeneous coal of sufficiently large size, or with a mixture of coke and coal, than could be secured with light coke, and better results too with a dense coke than with a porous quality.

Whenever the fuel contains small pieces, however, or if a porous coke is being used, it will become imperative to furnish an adequate supply of air to the upper part of the melting zone, in order to completely burn up the carbon monoxide which will be formed. With a properly located second row of tuyeres, it should always prove possible to do away completely with the combustible gases which generally ignite and burn at the level of the charging door, and so give unmistakable evidence of defective operation in the cupola. But how is it that, upon inspection, cupolas fitted in this manner, it is generally found that after a certain number of fusions, the upper tuyeres have been put out of use in most cases? The reason is that it is an extremely difficult matter to place these tuyeres in the exact position they should occupy, and even then, to give them the proper dimensions. If they are made too large, they give an excess of air which is worse than incomplete combustion of the fuel. The air has a tendency to go through these tuyeres in greater quantities than through the lower ones; the lower part of the melting zone cools down and the upper tuyeres get clogged with slag which forms a circular cushion, projecting above them and finally grows in size, to the extent of separating the metal from the melting zone.

The specific gravity or density of the fuel, its greater or lesser porousness and its average dimensions, will, therefore, all be important factors in the problem of determining the positon of these tuyeres.

### Difficulties.

A cupola, like a producer, must be designed to meet the particular requirements of the fuel it is intended to burn, both as to quality and as to dimensions.

The difficulties besetting this problem would be greatly reduced if it were customary to proceed in the same manner for a cupola, as it is for a gas producer, viz., if a suitable proportion of steam or carbonic gas were blown into the fire at the same time as the air; by this means a constant temperature, not exceeding very much that of melted iron, could be maintained with comparative ease at the level of the lower tuyeres, regardless of the size of the fuel; a large amount of combustible gases would be generated by the dissociation of the steam and by the reduction of the carbonic gas, as well as by the combustion of the fuel with air; then, a secondary supply of air coming in through the upper tuyeres would burn these gases back again into carbonic acid and steam, thereby developing a large amount of heat.

The entire melting zone would thus be kept at an even and constant temperature, without any fear of its going any higher at any given point, where it might burn the iron and so deteriorate its quality and make it unfit for use. There would be no excess of cold air in any part of the zone and consequently, no tendency towards the formation of congealed slags around the tuyeres to narrow down the melting zone; the capacity of the cupola would only be limited by the resisting powers of its lining, which means that it would become from 10 to 20 times as large as that of cupolas blown with cold dry air. The complete disappearance of all slags blocking the tuyeres and interfering with the run of the cupola, would make operations extremely regular and certain; the volume and pressure of the blast could be reduced and a considerable economy effected in driving power for the blowers; the quantity of fuel per ton of iron turned out could also be reduced and, lastly, no flames would be seen either at the charging doors or at the top of the stack.

### Suitable Conditions for Cupola Operation.

The conclusions to be drawn from the above are that the conditions most suitable for the proper operation of a cupola are the following:

Distribute the blast through several rows of tuyeres, with a view to securing as complete and perfect a combustion as possible of the carbon and of the combustible gases; keep an even temperature throughout the entire melting zone, taking care to make the cross section of the upper tuyeres much smaller than that of the lower ones, so as to avoid sending an excess of air into the upper strata of the melting zone.

### Location of the Tuyeres.

See that the position of these tuyeres varies according to the nature of the fuel, according to its degree of average humidity and according to its size, always bearing in mind, at the same time, that any fuel will always act with regard to the blast, in the same manner as if it were all composed of pieces of the smallest size it contains; also, that anthracite and dense cokes will have a deoxidizing power considerably inferior to that of light porous cokes.

It will always be advisable to mix with the blast a stated amount of gases subject to being deoxidized by carbon at a high temperature, such as steam or carbonic gas. This will prevent the temperatures becoming excessive at points where the combustion is most active, and so preclude the possibility of burning the iron; it will also transfer any excess of heat existing around the lower row of tuyeres, to the upper strata of the melting zone, and in particular to that part of the fuel bed immediately in contact with the metal. As to the manner in which these auxiliary gases are to be procured, it is one of extreme simplicity, for all that is required is to draw them off from the upper part of the cupola itself, just beneath the level of the charging door where they are drawn off by means of an apparatus specially designed so as not to develop excessive temperatures in the blast piping. The result of this is to mix with the air of the blast, not only the carbonic gas resulting from the combustion of the coke and the steam coming from the humidity carried by the fuel, but also a portion of the carbon monoxide, which is just so much more fuel saved, as well as a certain amount of B. T. Us. furnished by the apparent heat of all the gases.

### Practical Application of Reactions.

These processes and reactions were turned to practical use by A. Baillot, and so far, the results obtained by him, both in Europe and in America, in the various applications he has made of them, have been highly satisfactory. As much as 15 pounds of iron have been turned out per pound of coke, bed included, and the iron has always been found to be of quite a superior quality. In fact, Mr. Baillot has realized in actual practice all the desirable advantages enumerated above and, at the same time, secured greater speed of melting and increased capacity of cupolas for a given size than was heretofore possible.

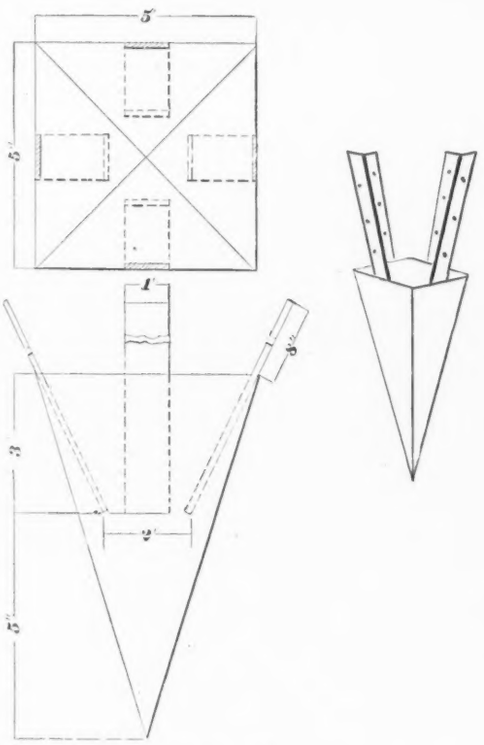
---

## PILE DRIVER CASTINGS.

By Z. A. Cooke

In driving piles it has been found that for penetrating shale or other hard substances which cause unusual resistance, that a cast iron shoe attached to the end of the pile not only facilitates the driving, but prevents the shattering and shivering so common in this work. The cost of attaching such a shoe to every pile is, however, expensive, and the best and cheapest method of producing these shoes in the foundry is an item of considerable importance. We recently had occasion to supply a number of shoes as shown in Figs. 1 and 2. The straps on the four sides were to be cast into the shoe, drilled with ¼-inch holes, and were to extend to 8 inches above the top for fastening the point of the pile, which was tapered on the four sides to fit the inside of the straps. As quality and finish were of little importance, the castings were made in open sand and flasks, prints on patterns, etc., were dispensed with. The holding of the wrought iron straps in the proper position while pouring was the problem to be overcome.

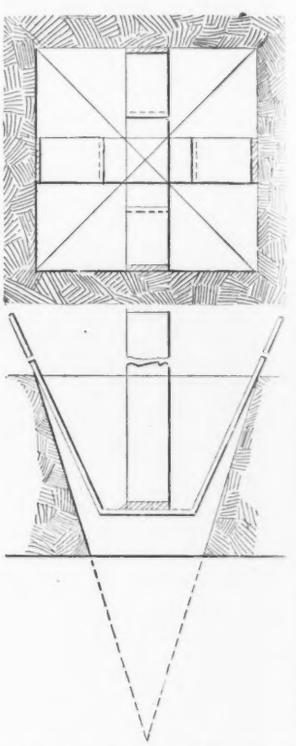
It was necessary to equip a rig for each mold, or to hold the straps by



THE PILE DRIVER CASTING

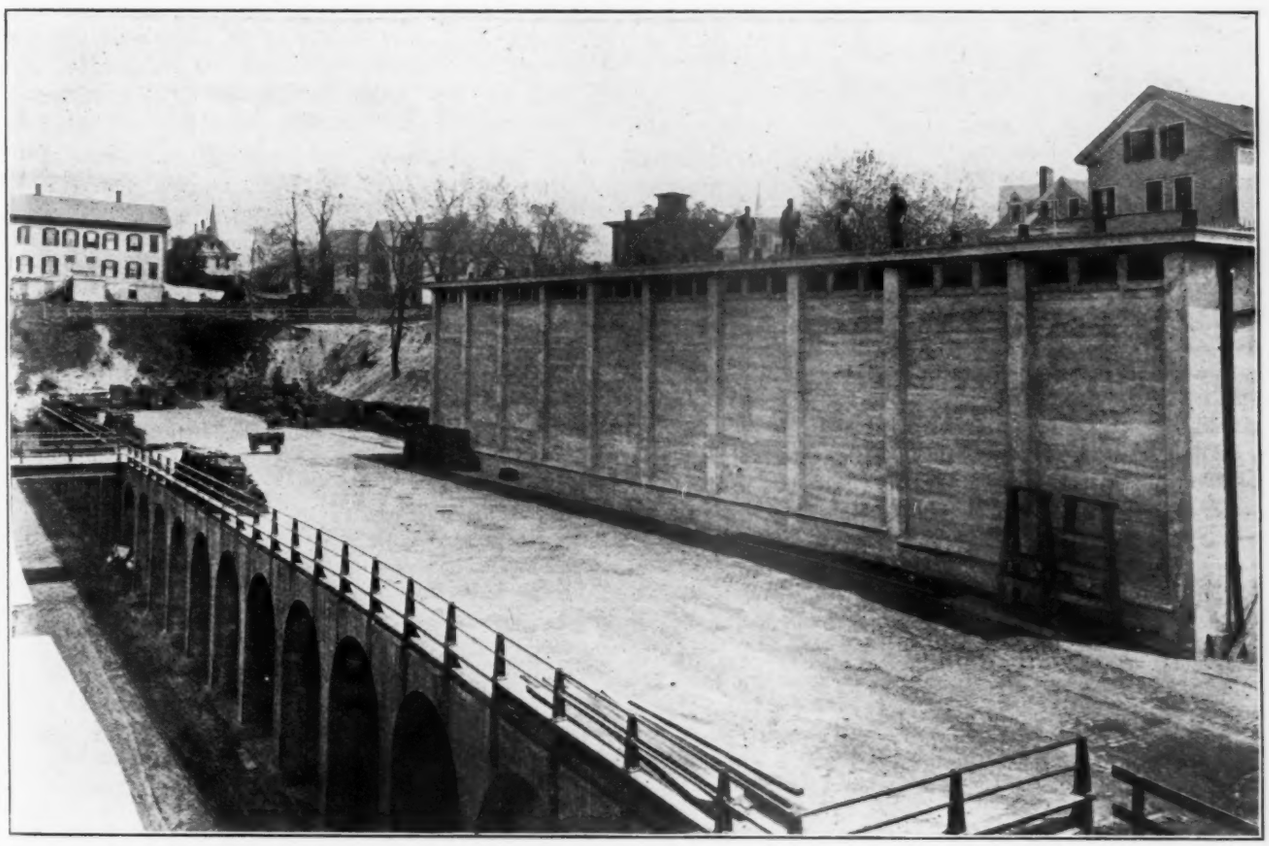


FIGS. 1 AND 2—PLAN AND SECTIONAL VIEWS OF PILE DRIVER CASTING



FIGS. 3 AND 4—METHOD OF MOLDING PILE DRIVER CASTING IN GREEN SAND

hand until the mold had set. Both these operations, however, were too expensive to consider. The method employed, shown in Figs. 3 and 4, proved very satisfactory. The straps were drilled and then forged to the required shape. The connection of both sides by continuing the strap across the mold proved immaterial. After they were forged and drilled the straps were placed in the mold as shown and then poured. With a little care on the part of the molder in placing these straps, it was found that the four sides would have practically the same angle, and after being placed properly there was very little shifting.



A Reinforced Concrete Coke Pocket

## A REINFORCED CONCRETE COKE POCKET.

The increasing application and adaptability of reinforced concrete to the construction of coal, coke and sand pockets, and its superiority to brick in strength, and to wood in durability and strength, has led to a constantly growing demand for structures of this material. An interesting structure of this type embodying some unusual features is the coke pocket built for the Brown & Sharpe Mfg. Co., Providence, R. I., by the Aberthaw Construction Co., Boston, shown in the accompanying illustration.

The pocket is about 120 feet long and 41 feet wide, 26 feet high at the north end, and 26 feet wide and 24 feet high at the south end. The east side is built against a 30-degree inclined bank bordering directly on the street. The west side faces the foundry and is supported by a series of massive concrete sand bins whose capacity is over 80,000 cubic feet. Adequate lighting and ventilation is provided for by a number of 36 x 20-inch openings in the concrete walls directly under the roof, well protected by the overhanging eaves on the west side.

The roof, which has a general slope of ¼ inch to the foot, is supported by ten 7-inch steel I-beam rafters, carried on heavy I-beam girders running lengthwise of the pocket. There are nine of the latter, three 20 inches and three 24 inches in depth, the rest built up of web plates 24, 30 and 33 inches in depth, reinforced at the top and bottom with 5 x 3½-inch flanged angles. These are supported by 14 x 18-inch reinforced concrete columns 10 feet apart, forming part of the 5-inch walls. Steel reinforcement of the walls consists principally of a net work of twisted square rods, but in the case of the columns for supporting the long span steel beams, channels back to back are embedded in the concrete.

The coke teams are driven directly onto the roof from the street and the coke dumped into the pocket through 2 x 4-foot holes in the roof. Of these there are 18 spaced on 10-foot centers in two rows 10 feet apart. This arrangement allows sufficient space for two teams to dump at the same time into adjacent openings. To prevent any possibility of the wagon backing off the roof 8 x 8-inch joists raised 4 inches, run entirely around the edge, and as a double security a 6-foot iron rail fence is placed outside of these.

Nearly opposite the coke pocket and across the bridge or runway are the cupola furnaces, the charging floor for which is on the same level as that of the pocket. On the north side close to the bridge is situated the only door from which coke can be taken out. This is 9 feet high by 6 feet 11 inches wide, furnishing sufficient room for the passage of two hand carts or barrows without interference.

Since the photograph was taken the entire area above the concrete sand bins, including the bridge, has been covered as a protection from the weather.

# A SIMPLE FLASK RECORDING SYSTEM

## The Card System Applied to the Flask Storage—Great Economies Effected

BY H. VAN BILLIARD

THE METHOD of taking care of and keeping a correct record of flasks has been more or less a problem in most foundries, and has given me personally considerable trouble in the past.

When flasks are required it is almost always on short notice, and very often just when the foreman cannot give his personal attention to this very particular work, he will have some one else looking for flasks which he is satisfied are in the yard somewhere, and after spending a few hours time hunting for them he is told they cannot be found. He will then investigate himself, but will not in some cases be able to locate them. The flask maker will then be called in and perhaps a new flask made or some other one which is in good condition for another pattern will be changed. Later, after the job is completed and he happens to come across the very flask he wanted and that he knew he had at that time, he very often feels like saying things (and perhaps does) to the man who could not find this flask before, but when told that he himself had failed to find it, he has nothing more to say. This is not a very pleasant thing for the foreman or a profitable one for the company.

### Card System.

Following is an outline of the system I have installed at the foundry of the General Railway Signal Co., Rochester, N. Y., which has given me considerable comfort and may be of some use to other foundrymen. I use the card system for our pattern and flask records, and as the foundry foreman has charge of the pattern vault, the two records are kept in the foundry office. This gives me an advantage as the two records can be maintained together very well, and also simplifies the system, as the number of the flask to be used for a certain pattern is noted on the pattern card.

Fig. 1 shows the card used which is standard size, 3 x 5 inches, and shows the flask number, size, quantity, material, cost, etc., also the pattern number of all patterns which can be molded in that size flask. All flasks are numbered numerically. The numbering can be done in different ways. I used cast iron stamps that I made with 1¼-inch reversed figures from 0 to 9, and in that way I secured any combination desired.

### Method of Numbering the Flasks.

The number is stamped on both ends of each flask, when possible, near the handle and in the center of the cope and drag. Both cope and drag are numbered in all cases. On iron flasks I painted the numbers at such places best suited for the same and they can be renewed when necessary. This I find is not very often as I have had flasks in use for two years and have had no occasion to renew the number. As to wooden flasks, I find that the number lasts as long as the flask when stamped as mentioned.

Various sizes have different numbers, but all of the same sizes are numbered the same, thus: Size, 20 x 24 inches—cope 6 inches—drag 6 inches—is No. 14, while size 20 x 24 inches—cope 7 inches—drag 7 inches is No. 20.

A card is made out for each of the various sizes of flasks as shown in Fig. 1, and properly indexed and kept in a drawer with the pattern records.

For indexing purposes, I use the standard 3 x 5-inch five-cut guide card, the first cut is marked 12 inches, second 13 inches, third 14 inches, and

| | | | | | |
|---|---|---|---|---|---|
| Flask No. 14 | Size 20"x24" | | Quantity 10 | | |
| | | | Material | | |
| No. of Boards 10 | For Patt. No. 2240 | | Bars | Sides | Ends |
| Size of Board 24"x38" | Cope 6 | No. of Bars 4 | Cement | Cement | Cement |
| Hinged Yes | Cheek | No. of Bars | | | |
| | Drag 6 | No. of Bars | | Cement | Cement |
| Remarks Use for Patterns 1672—1721—1870 | | | | | |
| Date Feb 25—08 | | Cost Each $1.15 | | | |

The Foundry

FIG. 1—FLASK RECORD CARD

| FLASK NO. | SIZE | FLASK NO. | SIZE | FLASK NO. | SIZE | FLASK NO. | SIZE | FLASK NO. | SIZE |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 32"x36" | 10 | 12"x48" | 19 | 22"x28" | 28 | | 37 | |
| 2 | 26"x46" | 11 | 38"x38" | 20 | 20"x24" | 29 | | 38 | |
| 3 | 17"x52" | 12 | 20"x42" | 21 | | 30 | | 39 | |
| 4 | 21"x54" | 13 | 28"x62" | 22 | | 31 | | 40 | |
| 5 | 24"x48" | 14 | 20"x24" | 23 | | 32 | | 41 | |
| 6 | 36"x36" | 15 | 16"x108" | 24 | | 33 | | 42 | |
| 7 | 16"x36" | 16 | 16"x96" | 25 | | 34 | | 43 | |
| 8 | 37"x61" | 17 | 18"x18" | 26 | | 35 | | 44 | |
| 9 | 17"x46" | 18 | 11"x96" | 27 | | 36 | | 45 | |

The Foundry

FIG. 2—CROSS INDEX—REVERSE SIDE OF CARD

so on; one index card for every inch up to 60 inches. All flask cards are indexed according to width, that is, all of the same width regardless of depth or length are indexed the same.

When I want a flask 32 x 36 inches I turn to index card 32 inches which contains cards for all flasks 32 inches wide and 32 inches or over in length. This applies to all sizes.

**Cross Index.**

For a cross index I take one (or as many as needed) of the flask cards and rule the back of same as shown in Fig. 2. This card is kept in the same drawer with the flask cards and is used as follows: If I want to know the size of flask No. 10, I refer to the cross index card and find it is 12 x 48 inches, then by turning to index card 12 inches I find size 12 x 48 inches, No. 10, and I have all the information desired.

Flasks are stored in a shed built for that purpose provided with an industrial railway which is used for conveying flasks to the foundry. The shed is divided into sections as follows: Section A contains flasks Nos. 1 to 12; section B, 13 to 28, and so on. All flasks when not in use go to the same place in the shed.

When I receive an order for a certain casting, a molder's ticket is made out giving the order number, pattern number, quantity wanted, price per hundred and what number flask to use. I refer to our pattern record in order to find the location of such a pattern in the vault. At the same time I find a notation on the card to use flask, say No. 26, which is noted on the molder's ticket. This ticket is attached to the pattern, which is then ready for the molder.

When the molder receives the pattern he simply looks at the ticket attached which tells him how many castings are to be made and to use flask No. 26. He tells the man in charge of the flasks, he wants so many flasks No. 26, and this man goes to flask shed and looks for No. 26 which he finds in section B, and in a very short time the molder has his flasks and no time is lost hunting for them.

**New Patterns.**

When I get a new pattern, or one that has not been used since the installation of the above system, I find a suitable flask for the same, or when necessary, make new ones and number them. The pattern number is noted on the flask card and the flask number noted on the pattern card.

In this way the record is kept up at very little expense and is complete in every way.

After once installed, not much work is required to keep it up, and it is surprising how much time it saves. The foreman can keep himself well posted as to what sizes and how many flasks he has on hand and the value of the same, which can also be used for inventory purposes.

## ENGLISH INSTITUTE OF METALS.

The formal constitution of the Institute of Metals recently organized in England, took place at a meeting held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, London, S. W., on Wednesday, June 10. There thus comes into life a new body, which may well aspire to rival in importance the old and powerful institution upon which it is modeled, the Iron & Steel Institute. The Institute of Metals differs from the Iron and Steel Institute, however, in that it confines its attention to the non-ferrous group, copper, brass, lead, etc. The objects of the Institute are succinctly stated in the resolution passed at the preliminary meeting at Manchester in February. They are: (1) To afford a means of communication between members of the trades in question, bearing upon their respective manufacturers, excluding all questions connected with wages and trade regulation; (2) To arrange periodical meetings for the purpose of discussing practical and scientific subjects relating to the manufacture, working up and use of the non-ferrous metals. The range of activities of the new society covers the entire group of non-ferrous metals, not excluding the precious metals, gold, silver and platinum. The meeting, which was held on June 10, was presided over by Sir William White, and the attendance included a representative body of English manufacturers.

Sir William White gave an address of welcome, in which he pointed out the field that the new Institute should cover, showing that it would not in any way encroach upon that now occupied by the Iron and Steel Institute, the Institute of Mechanical Engineers, or the Institute of Mining Engineers. In fact, he stated that the movement had the hearty support and co-operation of the Institute of Mechanical Engineers, and allied societies. He thought that there was no doubt that the time had come when the Institute of Metals had shown a right to exist, and that those who were concerned in the use of these metals were of the opinion that a separate organization should be formed. The Institute was not established to capture trade secrets, but to educate by interchange of information, by discussion and by the publication of papers. Upon Sir. William White's suggestion, a resolution was passed, establishing the society and giving it the official name—The Institute of Metals.

Following the passage of the resolution, Sir William White was unanimously elected first president of the Institute. The election of the chairman was followed by the election of a temporary council, which was empowered to appoint the secretary and treasurer, draw up the constitution and take such other steps as might be necessary for the formation of the Institute. The annual subscription was fixed at two guineas ($10). A general discussion of the work which lies before the new society followed, at the close of which the meeting adjourned.

# MANGANESE BRONZE*

BY C. R. SPARE

IT IS NOT the intention to review, in this paper, the history of the development of the various manganese bronzes up to the present day but to outline briefly the vastly extended uses to which these valuable alloys have been applied in recent years by the various industries and, more especially, to point out the methods of testing employed and the physical results obtained.

The best present day alloys of manganese bronze are the results of years of scientific research by several of the largest manufacturing concerns in the world, who maintain chemical and physical testing laboratories in connection with their brass foundries. Of all the metal industries, brass founding is almsot the last to pass from the empirical and rule-of-thumb to a scientific metallurgial basis. In fact the majority of the brass and bronze manufacturers today have never used chemical analysis or a testing-machine and, therefore, have only a general idea of the composition and physical properties of their products. This is the result of natural conditions, which years ago did not impose severe requirements on brass and bronze.

**Changing Conditions in the Trade.**

Today conditions have changed, or

*Presented at the annual meeting of the American Society for Testing Materials.

are changing, and engineers have multiplied powers and manipulated pressures beyond all former figures. Machinery is more powerful, more complicated and more severely tested than ever before, and while steel and other industries have made great advances and kept apace of requirements, the same ratio of improvement has not been maintained in the copper and brass metals, excepting in the case of the high tensile strength manganese bronzes.

There are several brands of manganese bronze on the market, each with its own characteristics, which are determined by the chemical composition and the process of manufacture. While upon analysis some of these bronzes do not reveal striking differences in composition, yet these alloys are susceptible of wide variations in physical properties by slight changes in composition, difference in quality of raw materials and methods of melting and mixing.

Certain impurities affect very injuriously the strength and ductility of manganese bronze, causing brittleness and crystalline texture. It is not within the compass of this paper to discuss these differences but they become very evident in the testing-machine.

### First Practical Application.

Manganese bronze first found its important practical application in the manufacture of propeller wheels for ships. Now, cast iron and cast steel have been almost universally displaced by it, not only for all naval vessels but the merchant ships of the world have adopted it as standard practice. Marine engines have been increased to such vast powers, especially during the past ten years and since the advent of the steam turbine that 20,000, then 40,000 and now 70,000 indicated horsepower are transmitted through manganese bronze propeller wheels. In some ships the speed runs upwards of 300 revolutions per minute.

There is no metal of equal strength and toughness which will produce such sound, smooth and intricate castings, true to the form of the pattern. These qualities permit of the maximum fineness of section of the propeller blade and at the surface speeds of thousands of feet per minute, the surface friction is reduced to a minimum.

### Resists Corrosion.

This bronze is practically incorrodible in sea and alkali waters. Likewise dilute acids and acid mine-water are resisted very successfully. Long time tests have been made with the various acids and mine-waters. Cast blocks of manganese bronze immersed in the most acid mine-water in Pennsylvania, containing about 300 grains sulphuric acid per gallon, for one year, showed no material corrosion and a test-piece cut from this metal showed no diminution in tensile strength over a duplicate specimen previously tested.

Test-pieces cut from cast propellers should show an average ultimate tensile strength of 70,000 pounds per square inch, elastic limit of about 35,000 pounds, or one-half the ultimate, elongation in 2 inches, 25 per cent, and reduction of area 25 per cent. The reduction of area follows the elongation closely in cast manganese bronze.

These figures can be varied to suit requirements. A soft manganese bronze having an ultimate strength of 60,000 pounds per square inch and 40 per cent to 50 per cent elongation in 2 inches in the lower limit, while an exceedingly hard manganese bronze can be made to test over 90,000 pounds per square inch, with even as much as 30 per cent elongation. The methods of testing manganese bronze physically do not differ materially from the standard methods for steel. Test-pieces according to the standard United States Government sizes, 0.505 inch, 0.798 inch, or 1.000 inch diameter are machined 2 inches between punch marks, and threaded. In the case of casting there is not a sharply defined elastic limit and the yield point cannot be determined by the drop of the beam. A multiplying dividers (such as devised by J. A. Capp) or a standard extensometer will establish quite closely the point at which an appreciable change in the rate of stretch takes place. In the case of rolled or forged manganese bronze, the yield point is more closely defined and the elastic curve is frequently sharp enough to detect the drop of the beam or a halt of the gauge wheel.

### Manganese Bronze in Compression.

In compression, cast manganese bronze, if properly made, shows an average elastic limit of 35,000 to 40,000 pounds per square inch, and a maximum crushing load of 90,000 to 100,000 pounds per square inch. Rolled or forged manganese bronze tests 50,000 to 60,000 pounds, elastic limit and as high as 130,000 to 150,000 pounds maximum crushing load.

Manganese bronze can be rolled or forged readily at a red heat with the production of an exceedingly tough, dense and close grained metal. Microscopic examination of cast manganese bronze, after polishing and etching, reveals a very homogeneous and uniformly grained metal, but after rolling or forging to a sufficient reduction, the structure is reduced to from 1-30 to 1-50.

Rolling or forging raise the proportional elastic limit to from 45,000 to 75,000 pounds per square inch depending upon the finishing temperature and the amount of work done on the metal. Likewise the ductility and toughness are increased without, however, a corresponding increase in ultimate strength.

Forged and rolled rods find a wide application as piston rods, shafts, axles and for all purposes where a metal of equal strength and toughness to carbon steel is desired and which will not rust or corrode in the atmosphere, mine, or sea water.

### Soft and Tough Metal.

An especially soft and tough metal is made to resist vibratory and sudden stresses and shocks. It is used under very severe conditions in modern naval ordnance. It also is finding application in staybolts for locomotives. This bronze tests 40 per cent to 50 per cent elongation, with about 60 per cent reduction of area.

Thus only a few of the better known applications of manganese bronze have been pointed out. The electrical industry is calling for it for turbo-generator sets which are run at speeds up to 4,000 revolutions per minute and the blades of the steam turbine are satisfactorily made of extruded manganese bronze shapes. In this case the erosive action of high pressure steam is a severe condition, under which most metals fail.

### Manganese Bronze in the Automobile Industry.

The infant industry of this country, which has grown to such lusty proportions, the automobile, has set a very high standard for materials which must stand up under its peculiarly hard service conditions. Automobiles with gasoline motors of 60, and even as high as 130 horsepower, at speeds of 1,000 to 1,500 revolutions per minute and running over all kinds of roads at 60 and 100 miles an hour, have stimulated the improvement of the materials entering into their construction more, perhaps, than any other modern machine. The nickle-chrome and other high grade steels in gears and drop forgings have produced results never heard of before and cast iron has been wonderfully improved by the requirements of automobile cylinders.

## NICKEL DIFFICULTIES.

*Question:*—I am making castings of a mixture of nickel, wrought iron, copper and tin. These are made in flasks rammed with No. 2 molding sand and are malleable. Along with the malleable castings I make nickel castings. As nickel is very brittle and will easily break if made in thin small sections, I therefore make the small malleable castings to withstand rough usage. Both the malleable and nickel castings are joined together, but in place of soldering the two castings I place the malleable casting in the nickel mold with the sand cut away so that the melted nickel will run around it. The fact that wrought iron melts at a higher temperature than nickel compels me to ask why the latter burns away when it comes in contact with the nickel. Is there any way to overcome this difficulty? Briefly explained, the problem is as follows: If one had a mixture of nickel, wrought iron, copper and tin and made a casting of the same, and then made a mold for nickel, placing the casting made of copper, nickel, wrought iron and tin in the same and then poured in the nickel, why is it that when the melted nickel comes in contact with the casting, it will partly burn away?

*Answer:*—The reason why the alloy of copper, nickel, wrought iron and tin burns away when the melted nickel comes in contact therewith is, that the alloy has a much lower melting point than the nickel. Pure wrought iron probably would not burn away or melt when in contact with the nickel, but when it is alloyed with tin, copper, etc., its melting point is lowered and it will not withstand the high temperature of the nickel. I am not in a position to give you information as to overcoming your difficulties, as I do not know what kind of castings you are making or what they are used for. It is evident, however, that if such castings must be made and in the manner stated, the melting point of the nickel must be lowered until it does not burn away the malleable alloy. You could do this by adding copper to the nickel. The color of the copper and nickel alloy would still be the same as nickel. You will have to use your own judgment about this, however, as I have no means of knowing whether it is necessary to use pure nickel or not. Neither can I see why copper and tin must be added to the alloy of iron and nickel. It seems reasonable that if the copper and tin were omitted the malleable alloy would withstand the heat of the molten nickel, which would be another way out of the difficulty. You are probably aware that the brittleness of your nickel is due to the absorption of carbon and if malleable nickel is desired, clay and not graphite crucibles must be used in melting. If you use grain nickel deoxidized with 1 per cent of manganese and melt in clay crucibles, you should be able to obtain malleable nickel castings. K. K.

---

Announcement is made by the Federal Foundry Supply Co., Cleveland, that it has secured the services of Ralph Ditty as manager. He was formerly general manager of the Buckeye Milling Co., Cleveland and originated the Cleveland dry core compound and the Wago core binder. When this concern was consolidated with the H. E. Mills Mfg. Co., Syracuse, N. Y., he was elected secretary, which position he resigned May 1 to assume the management of the Federal Foundry Supply Co. This concern manufactures Bright's dry core compound in three grades: No. 1 for heavy gray iron, No. 2 for steel, malleable brass, light and heavy gray iron, and No. 3 for car wheels.

---

## CORRECTION.

In the description of the plant of the Dickson Car Wheel Co., Houston, Texas, published in the July issue of THE FOUNDRY, it was stated that the entire equipment, with the exception of the pitting cranes was installed by the Whiting Foundry Equipment Co., Harvey, Ill. We have been advised that this concern furnished all of the pitting cranes and controllers, together with the rest of the power equipment installed in this plant.

---

## MIXTURE FOR HEAVY CYLINDERS.

BY W. J. KEEP

*Question:*—Please give me a formula for large marine cylinders such as are used by the government. What I wish to know is the percentage of silicon, sulphur, carbon, etc., necessary to make good, strong, close grained iron.

*Answer:*—Silicon, 1.20 to 1.50 per cent; sulphur, 0.09 per cent; phosphorus, 0.35 to 0.60 per cent; manganese, 0.50 to 0.80 per cent. Transverse strength of a 1-inch square test bar 12 inches long, not less than 2,600 pounds. Tensile strength per square inch, 24,000 pounds. You might melt in the cupola 10 to 15 per cent of boiler plate clippings and add 1/10 of 1 per cent aluminum to the ladle. If you run an air furnace at the same time as your cupola use one-half cupola and one-half air furnace iron. This would probably give you better castings than would be required in most specifications.

---

## CUPOLA SLAG.

BY W. J. KEEP

*Question:*—We have lately had some peculiar slag effects from our cupola. We use limestone as a flux and the amount varies from 15 to 20 per cent of the coke charged. Our iron analyzes as follows: Silicon, 2.8 per cent; phosphorus, 1.2 per cent; sulphur, 0.09 per cent; manganese, 0.8 per cent. Sometimes the slag is a deep green and other times quite black. The fracture is bright or dull and there is frequently a reddish brown crust on top. From the above can you judge of our cupola efficiency, that is, from the slag appearance, as we understand a blast furnace man is able to do?

*Answer:*—It would not be practical to judge the efficient operation of a cupola from the color or appearance of the slag. The rest of the scrap and the character of the limestone would influence the color of the slag. An analysis of your limestone for lime, magnesia and sulphur contents may be of value to you. Iron pyrites are often found and will do more harm than sulphur in the pig iron. There should be no magnesia, or at least, very little. The limestone should contain at least 75 per cent of lime and no sulphur.

---

Colne & Co., 11 Broadway, New York City, formerly Powell & Colne, contractors for the erection of Tropenas steel casting plants, have just completed a large installation at the Mare Island navy yard, California, and the plant is now in successful operation. This makes a total of 33 converters installed by this concern in 10 years. As an indication of improving business conditions, this concern reports the receipt of several important inquiries for the erection of new steel castings plants and extensions to others.

---

## GRAPHITE.

The July issue of *Graphite* published by the Joseph Dixon Crucible Co., Jersey City, N. J., contains 16 pages. It includes several illustrations of the exhibits made by this concern at the recent convention of Master Mechanics and Master Car Builders Associations at Atlantic City, and the Foundrymen's convention at Toronto.

# THE FOUNDRY

PUBLISHED MONTHLY BY
THE PENTON PUBLISHING CO.

BOSTON.....73-74 Journal Bldg.
BUFFALO.....932 Ellicott Sq.
CHICAGO.....1328 Monadnock Blk.
CINCINNATI.....First National Bank Bldg.
NEW YORK.....90 West St.
PITTSBURG.....510 Park Bldg.
DULUTH.


*Copyright, 1908, by Penton Publishing Co.*


The subscription price of THE FOUNDRY is $1.00 a year in the United States and Mexico. To Canada, $1.50. To Great Britain, Eight Shillings. Single copies, 15 cents each.

Change of advertising copy must reach this office on the 10th of the month preceding date of publication.

The Cleveland News Company will supply the trade with THE FOUNDRY through the regular channels of the American News Co.

European Agents: The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Practical articles pertaining to the trade in all its branches are solicited, and will be paid for.

When sending articles be sure to place your name and address on the article and on the drawings.

*Entered as second-class matter at the Post-Office at Cleveland, Ohio.*


## CONTENTS.


*Production of Malleable Castings—VI* 273
*Value of Liquid Fuel in Brass Foundry Practice* 277
*Aluminum in Cast Iron* 278
*Vanadium* 278
*The Jobbing Brass Foundry—IV* 279
*High Pressure Yellow Brass Mixtures* 283
*A Uniform Foundry Cost System* 284
*Melting Manganese Bronze* 285
*A Study of Cupola Blast Pressures* 287
*Micro-structure of Foundry Irons* 289
*The Circular Saw as a Core Box Machine* 294
*Converter vs. the Small Open-Hearth—V* 295
*Chemical Reactions in Cupola Practice* 296
*Pile Driver Castings* 298
*A Reinforced Concrete Coke Pocket* 299
*A Simple Flask Recording System* 300
*Manganese Bronze* 301
*English Institute of Metals* 301
*Nickel Difficulties* 303
*Mixture for Heavy Cylinders* 303
*Cupola Slag* 303
*Trade Outlook* 304
*A Frequent Cause of Dissatisfaction* 304
*Tabor Jarring Molding Machine* 305
*Portable Heater* 305
*An Improved Chain Block Hoist* 306
*Gyrating Flame Crucible Furnace* 306
*Core Wire Cutting Machine* 307
*Plunger Core Machine* 308
*Portable Emery Grinder* 308
*Trade Publications* 309
*General Industrial Notes* 310


**Trade Outlook**

A slight improvement in the foundry trade is reported from all centers and idle plants are slowly resuming operations on the limited tonnage that is offered. Repairs that are being made by the railroads have resulted in the purchase of both malleable and steel castings, but no marked improvement is anticipated until orders are placed for new equipment. The activity of the agricultural implement plants reflects the prosperity of the rural communities and makers of equipment for this trade are operating their plants at almost normal capacity. Jobbing founders report the receipt of numerous small orders from diversified interests which indicates a re-awakening in many lines. Brass and aluminum foundries have recently closed large contracts with automobile manufacturers, but the trade in plumbers' supplies continues quiet and building operations do not foreshadow increased activity in this line in the immediate future. Pig iron quotations remain practically unchanged and production is still at about 50 per cent of rated capacity.

**A Frequent Cause of Dissatisfaction**

Why does the purchaser of a general line of castings insist upon getting satisfactory results from one foundry when his requirements cover the whole gamut from silk to burlap? On the other hand, it is difficult to understand why some foundrymen will attempt to furnish a complete line of castings, when they are only equipped to make "domestics." Both purchasers and producers have been pursuing these policies to the frequent dissatisfaction of both. The dry goods merchant who would insist upon one factory furnishing his entire requirements of all kinds of cloth would hardly be considered rational, but the purchaser who demands that one foundry shall furnish all his castings is asking nothing unusual, inasmuch as this has grown to be almost a custom in the trade. The foundryman, regardless of his equipment and general line of work, will frequently agree to make castings of any size and grade, provided at least 50 per cent of the buyer's requirements are adapted to his special line of work. The results are that the silks are frequently very poor, the woolens only fair, the domestics pass inspection, and the laces are made over three or four times and are then accepted only under protest. In a degree, the experiences of the dry goods trade apply to the founder. It is evident that it would be more profitable for the foundryman equipped to manufacture either silk or burlap to refuse orders so far removed from his line that he can neither make them economically nor satisfactorily. When making an estimate the foundryman could probably make a lower price and a better profit by refusing to bid on the class of work which he is not equipped to produce. Naturally the producer of a general line of castings prefers to ship his patterns to one foundry rather than to divide them among a number of plants, and the foundryman, on the other hand, anxious to increase his tonnage, will frequently make a few castings at a loss rather than lose the remainder of the order which he can produce satisfactorily at a profit. It is possible for most foundrymen to vary their line of work to a considerable extent, but to attempt to make a complete line of castings ranging from light to heavy and simple to intricate, is just as disastrous to the foundryman as it would be to the mill that attempts to manufacture a varied line of cloth far removed from its specialty. Few jobbing founders can closely limit themselves to one class of work, nevertheless, the refusal of orders for work that they cannot produce profitably at the average price covering the entire lot would probably result to their advantage.

## PERSONAL.

C. S. Redfield, advertising manager of the Yale & Towne Mfg. Co. New York City, has left for a three months' trip to Europe and will return the latter part of August. Mr. Redfield was recently elected president of the Technical Publicity Association, which embraces the advertising managers of most of the large electrical, machinery and industrial plants of the United States.

James O. Barnett recently resigned his position as manager of the steel casting department of the United Engineering & Foundry Co., Pittsburg, and has been made general manager of the American Roll & Foundry Co., Canton, O.

W. G. Nichols, former assistant superintendent of the Taylor Iron & Steel Co., Highbridge, N. J., has accepted the position of superintendent of the manganese steel department of the American Brake Shoe & Foundry Co., Chicago Heights, Ill.

Wm. Hanson, who for the past 20 years had charge of the foundry of the Pennsylvania Iron Works Co., Philadelphia, has been appointed superintendent of the main foundry of the steam engineering department, United States navy, at Norfolk navy yard, Norfolk, Va. Mr. Hanson has been in the foundry business for 30 years and has had a wide experience in the production of large work, particularly engine beds and Corliss cylinders.

# FOUNDRY & PATTERN SHOP EQUIPMENT

## Large Jarring Molding Machine—Portable Heater—Climax Chain Hoist—Gyrating Flame Crucible Furnace—Core Wire Cutting Machine—Plunger Core Machine—Portable Emery Grinder—Pneumatic Molding Machine

ONE OF THE largest jarring molding machines in the world has been recently built by the Tabor Mfg. Co., Philadelphia. The machine weighs 20,000 pounds, has a 24-inch diameter jarring cylinder, a 43 x 75-inch platen and 15-inch drawing cylinders. The machine possesses a number of unique features, the chief of which is the arrangement of the movable jarring table so that it fits over a stationary plunger piston. The fixed plunger is cast integral with the anvil and the jarring table slides over it, being guided by the plunger and two upright rods, one of which is shown at A in Fig. 2. This design permits a distribution of the metal in the jarring table best adapted to resist the severe shocks and stresses to which it is subjected. The table is very heavy and massive in construction. Eight cast iron ribs strengthen the platen.

The valve mechanism is somewhat unusual, and is shown in section in Fig. 1. In this illustration is shown the stationary plunger piston P, the movable jarring cylinder C sliding over the plunger, the internal port B, which terminates at the plunger head, the piston valve V and its connecting bell crank lever, the air inlet port I and the exhaust port E. On the rod are the adjustable tappets $T_1$ and $T_2$, the function of which will be explained later.

The operation of the valve is as follows: In the position shown in Fig. 1, compressed air is being admitted from port I, through the valve into port B, causing the jarring table to rise. In

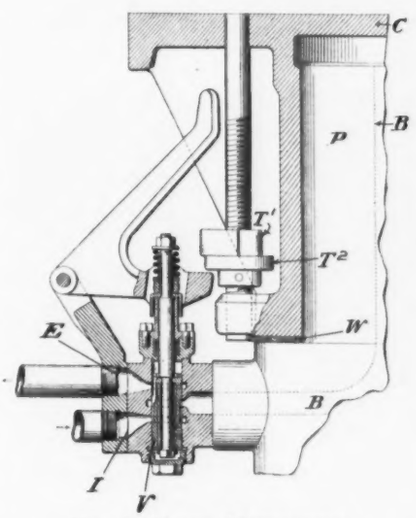



FIG. 1—VALVE MECHANISM

the course of its upward motion, the table carries with it the rod bearing the tappets $T_1$ and $T_2$. Tappet $T_1$ soon engages the upper end of the bell crank, thus lifting the valve. As soon as the valve is moved slightly, it uncovers a port which admits full air pressure to the small chamber underneath. This pressure accelerates the valve and almost instantly it completes its stroke. Port B is then connected to the exhaust port E, and the air under the cylinder exhausts through a full port opening; the cylinder C descends rapidly and strikes the anvil with a full jarring effect. On the way down, tappet $T_2$ engages the lower arm of the bell crank; the valve starts down, the air under the valve is released, and full pressure admitted on top, causing the downward stroke to be as rapid as the upward. With the valve at the bottom of its stroke, port I is again connected to port B, and the above described cycle of operations is repeated. The action is automatic, positive and quick; full port openings are obtained, and a maximum jarring effect results.

The shock of the blows can be cushioned to any desired degree by inserting alternate leather and steel washers between the striking face of the jarring cylinder and the anvil, as is shown at W in Fig. 1.

Two drawing cylinders, situated at either side of the jarring table, and operated by compressed air, are provided for drawing the mold off the pattern. These cylinders are 15

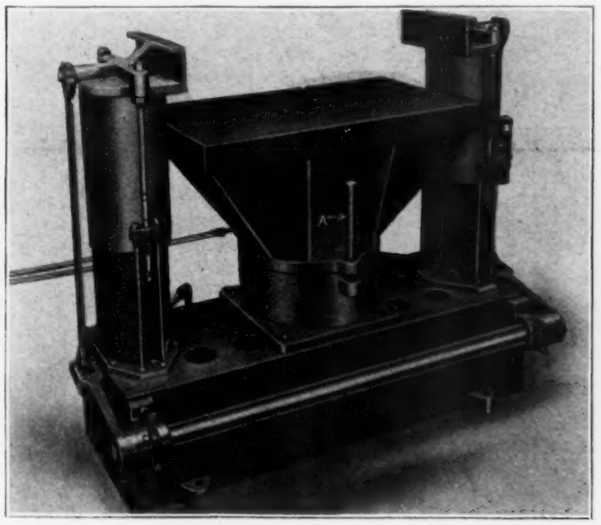


FIG. 2—TABOR JARRING MACHINE SHOWING GUIDES FOR RAISING THE MOLD, IN AN ELEVATED POSITION

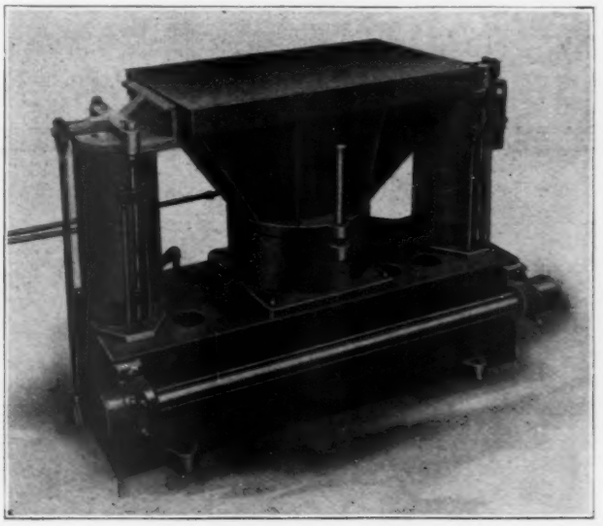
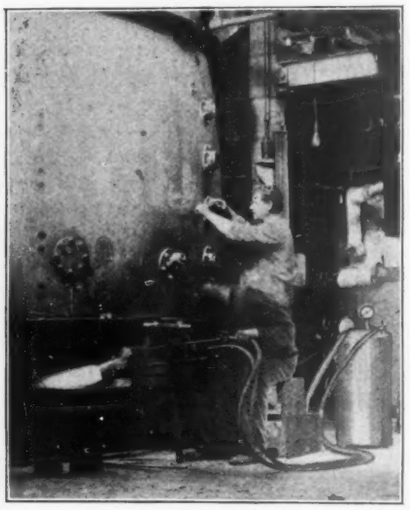


FIG. 3—TABOR JARRING MACHINE IN RAMMING POSITION

inches in diameter by 27-inch stroke. Their simultaneous operation is enforced by connecting the movable heads with a link work, the construc-



BRAZING CAST IRON WITH A PORTABLE HEATER

tion of which is clearly shown in Fig. 2.

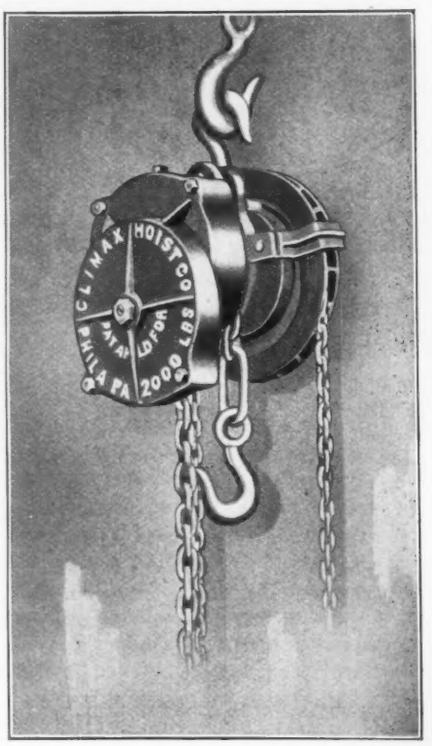
## PORTABLE HEATER.

The method of brazing a broken casting on a sugar pan with a portable heater is shown in the accompanying illustration. Either kerosene or fuel oil can be used with this burner, which is so constructed that complete combustion is insured. The oil is placed in a tank under pressure of from 15 to 100 pounds per square inch. From this a line of tubing conveys the oil to the burner where it is formed into a heavy gas, which burns with a strong blue flame, giving an intense heat. A hand pump is also provided for charging the tank, and securing air pressure where this is necessary. When brazing cast iron the fractured sections should be thoroughly cleaned, and if accessible a solution of muriatic acid should be applied and the parts should later be cleaned with water. If the broken parts are covered with paint, grease, oil, etc., the same should be removed, after which the acid solution, containing one-half acid and one-half water, should be applied. The pieces to be brazed are then set on fire bricks and held in position by fire clay, the fracture being surrounded by fire brick, thus forming a miniature oven and leaving an open space for the burner. The parts to be brazed are then heated to a bright cherry red and a flux is applied. Spelter is then used, which should flow freely through the joint.

The burner can also be used for lighting cupolas, the flame passing through the breast hole, which can be closed up after the fire has started. the time required for lighting the bed in this way is estimated at one-half to three-quarters of an hour and the consumption of crude oil is only about three gallons. The burner can also be used for heating ladles and drying molds. The heater is furnished by the U. S. Chaplet & Supply Co., 140 Cedar St., New York City.

## AN IMPROVED CHAIN BLOCK HOIST.

The accompanying illustration shows an improved chain block hoist which has been placed on the market by the Climax Hoist Co., 1753 No. Howard street, Philadelphia, Pa. The hoist is




CLIMAX CHAIN HOIST

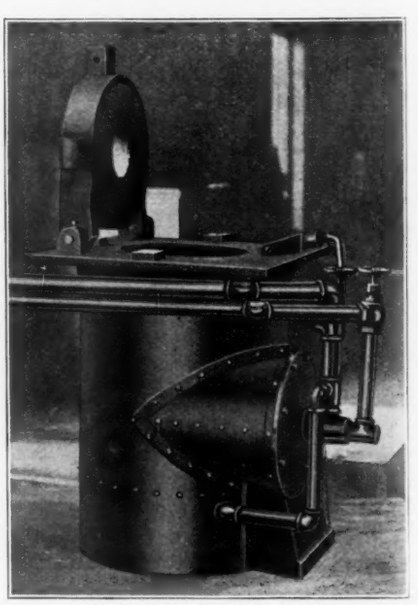
stated to have an efficiency of 80 per cent. The load is carried on hardened and ground rollers and all gears are enclosed and run in a bath of oil. The hoist is provided with a retaining brake and is noiseless in operation. All parts are made to jig and are interchangeable.

The principle of operation of the hoist is as follows: The load chain runs in a sprocket which is keyed to a long sleeve supported in the housing and cast in one piece with an internal load gear. This gear is driven by a spur pinion carried on a stud. The pinion is in one piece with an internal gear, in turn driven by a spur pinion carried on the hand chain wheel shaft which passes through the hub of the load gear to the opposite end of the block where the hand chain wheel is situated. Hoisting is accomplished by pulling on the right hand side of the hand chain wheel, thereby rotating the mechanism as described. To lower, the left hand chain is pulled, this action releasing the friction brake and permitting the load to descend.

## A GYRATING FLAME CRUCIBLE FURNACE.

The Kroeschell-Schwartz gyrating flame crucible furnace shown in the accompanying illustration is well adapted for the melting of the softer metals, such as brass, copper, zinc, tin and all non-ferrous alloys. The metal is charged in a crucible which protects the mixture against the flame and prevents it from coming in direct contact with the metal. In the pit furnaces, in which coal and coke are used as fuel, more or less difficulty is experienced in feeding the metal into the crucible, owing to the necessity of lifting off the cover. Feeding the fuel around the crucible and the raising of the pot higher in the furnace, owing to the burning out of the fuel bed, resulting in cold metal in the bottom of the crucible, are other difficulties that must be contended with. By the use of oil or gas as fuel these troubles are obviated.

This furnace is so designed that the melting is carried on from the bottom of the crucible upward through the metal, and perfect combustion of the oil or gas used as fuel is insured by the use of a low pressure air blast, which



GYRATING FLAME CRUCIBLE FURNACE

properly atomizes the oil, and mixes it with the proper amount of air when using gas. The noise of the air blast has been reduced to a minimum by the use of a combination oil and gas burner. This is accomplished by the blast of air being deflected in the burner itself. In the construction of this furnace the cost of removing the slag or spilt metal has been carefully considered and is accomplished by dropping the same through two slag holes in the bottom of the furnace and is deposited in an iron ingot mold in the furnace pit and can, therefore, be easily removed. These slag holes are also used as ports through which air is forced into the bottom of the furnace or combustion chamber. The metal is fed into the crucible through the cover of the furnace, which is provided with a hole in its center sufficiently large for this purpose. The waste gases pass through this opening and in so doing preheat the metal before it drops into the crucible. The furnace is lined with a refractory clay, thus eliminating the use of brick entirely. Inasmuch as the burner is operated at only a pressure of one pound and inasmuch as the air blast is deflected inside the burner, a long life to the lining is insured. For the same reason the crucible wears evenly and its period of usefulness is increased to a marked extent.

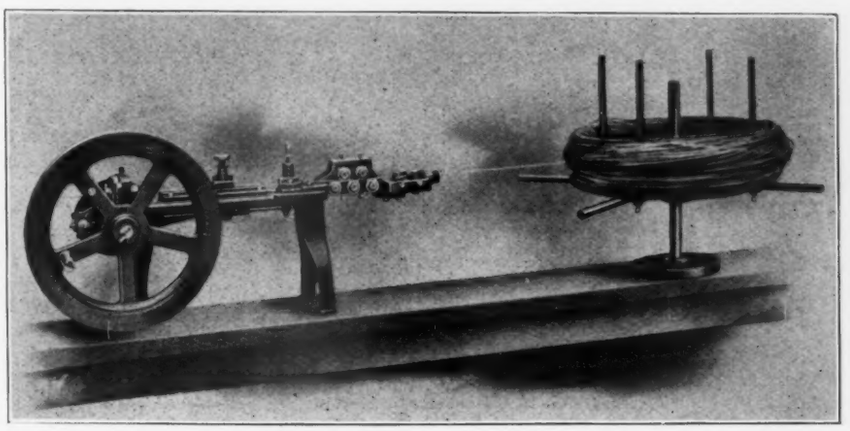
Tests made with the use of a No. 60 crucible showed a fuel consumption of only 1½ gallons of oil for 100 pounds of yellow brass or bronze, and the metal was poured 40 minutes after placing the crucible in the furnace. With the use of illuminating gas of 600 B. T. U., 300 pounds of metal were melted with a consumption of 817 cubic feet of gas. The time required for melting was 65 minutes. By the use of natural gas or oil the time required for melting is reduced in proportion to the increased number of heat units in the fuel. In addition to the reduced fuel cost and the saving of labor, this furnace can be operated continuously inasmuch as it is not necessary to clean out the furnace after removing the pot for pouring the metal. A new pot of metal is placed in the furnace immediately after a crucible has been removed, and thereby the cooling of the furnace is prevented. From six to 12 heats a day can be obtained according to the size of the crucible used. The temperature regulation is under the control of the operator and any required heat for melting the different kinds of metals can be obtained and a desired temperature can be held for any length of time.

The furnaces are of the same size as the coal or coke crucible furnaces generally used, and these can be replaced by the gyrating flame crucible furnaces without changing the foundation or enlarging the pits.

This furnace is built by the Kroeschell Bros. Co., 55 Erie street, Chicago, and is the invention of E. H. Schwartz, the well known inventor of the Schwartz melting and refining furnaces. He recently associated himself with the Kroeschell Bros. Co.

## CORE WIRE CUTTING MACHINE.

The core wire cutting and straightening machine shown in the accompanying illustration is designed to straighten and cut wires for cores for foundry use. On the improved No. 7 machine shown herewith, the bundle of wire is placed on the reel and is then put through the straightening rolls. This operation is very simple, the rear adjustable roll being set in far enough to put a bend in the wire and the next adjustable roll is set forward toward the wire to take out the bend made by the first rear roll. The forward roll in each set should always be adjusted in the direction that the wire is curving until it leaves the rolls absolutely straight. The wire passes from the straightening roll to the tension, which is provided merely to prevent the wire from slipping back when the clutch or shuttle releases it. The wire is then pushed forward through the shuttle, which grips it in its forward movement and slips over the wire when moving back. The length of the wire is gaged by the arm which connects the clutch with the graduated disc on the side of the machine. This disc has an adjustment up to 6 inches and for cutting wire in greater lengths a small lever is provided which, when set, causes the machine to cut every other revolution, thus doubling the length of the wire before it is cut off. In case an 8-inch wire is desired, the pointer on the disc is set at 4 inches; the lever is set and the machine will cut wires 8 inches long. This gives a capacity to the machine for cutting wires up to 12 inches in length and ⅛ inch in diameter. By means of a trip pin in the fly wheel, the machine can be adjusted so that it can be used as a wire straightening machine alone, thereby throwing off the cutting-off mechanism. The operations are quickly accomplished, each wire being measured automatically and regardless of any variation in the speed of the machine, all wires will be the same length. The wire straightening device can be adjusted for any size of stock. The machine has a cutting capacity of 100 wires per minute.



CORE WIRE STRAIGHTENING AND CUTTING MACHINE

The machine is manufactured by the Gregg Mfg. Co., 1318 West Fourth street, Cleveland, O.

## TRADE NOTES.

The Central Foundry Supply Co., Columbus, O., which was recently incorporated to take over the foundry supply business conducted under this firm name, has elected the following officers: President, John S. Ball; vice president, Dwight R. Mann; secretary and treasurer, Charles E. Whiton.

The Gregg Mfg. Co., of which F. M. Gregg is proprietor, has begun the manufacture of its machines for cutting and straightening core wire, dies and special machinery at 1318 West Fourth street, Cleveland. A number of orders have already been received for its core wire machine.

The shareholders of the recently or-

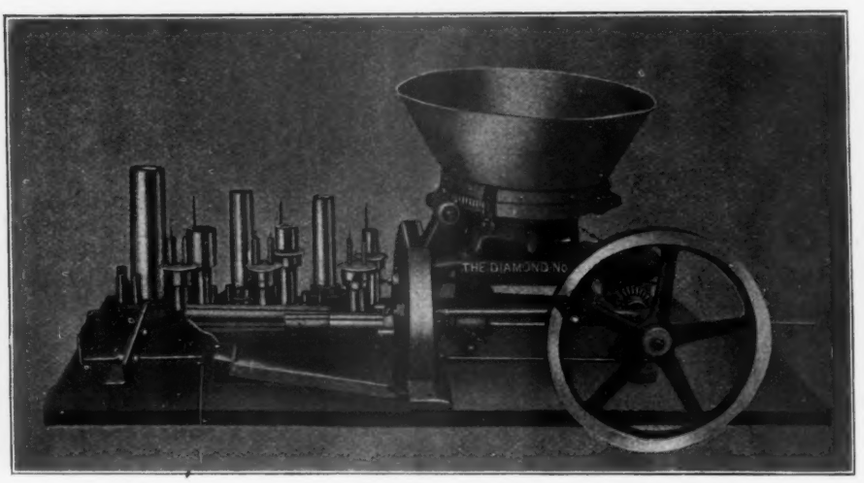
ganized Reid Foundry & Machine Co., Ingersoll, Ont., have chosen the following directors: David Reid, John A. McCullough, and Allan H. Marshall. Mr. Reid was elected president and general manager; Mr. Marshall, vice president, and Mr. McCullough, secretary. The company has already acquired a plant at Ingersoll, which is being improved, and operations will be commenced immediately. The new company will manufacture the Reid molding machine which was exhibited at the American Foundrymen's Association convention at Toronto.

Smith Bros., for the past 15 years producers and shippers of molding sand, near Albany, N. Y., have transferred their property to the Albany & North River Molding Sand Co., Albany. This is the largest transfer of molding sand property that has occurred in the Albany sand belt in many years, and comprises more than 300 acres of molding sand, principally coarse, strong machinery grades. The transfer includes the railway sidings and canal dock. Frank P. Smith will continue in charge of this plant for the Albany & North River Molding Sand Co.

The Schaeffer & Budenberg Co., Germany, has sold its plant at Foxboro, Mass., to the Industrial Instrument Co., which was lately organized with Bennett R. Bristol, formerly of the Bristol Co., Waterbury, manufacturer of recording instruments, as its head. The Standard Gage Mfg. Co. will be organized to operate the plant for the manufacture of gages, recording instruments, etc., and the property will probably be deeded to this company by the Industrial Instrument Co., as the same interests control both concerns. Watson E. Goodyear, Naugatuck, Conn., will be president of the the Standard Gage Mfg. Co.; Bennett B. Bristol, treasurer, and Arthur F. Mundy, Syracuse, N. Y., secretary. The plant is modern and well-equipped with two main buildings of brick, 60 x 210 feet each, and a foundry, 60 x 150 feet, which was added a few years ago at a cost of $20,000. No extensive orders for equipment will be placed at once, but different machine tools will be ordered as required.

The Cutler Hammer Manufacturing Co., Milwaukee, manufacturer of electric controlling devices, will hereafter be represented on the Pacific coast by Otis and Squires, 111 New Montgomery street, San Francisco. A. W. Vinson, who was connected with the engineering department of the Cutler Hammer Mfg. Co., has been transferred to the office of Otis & Squires, where his services will be available to those confronted with problems of electric control.

The Electric Controller & Supply Co., Cleveland, has changed its name to the Electric Controller & Mfg. Co. The latter name more truly indicates the nature and scope of the business of this concern, as is evidenced by the following list of apparatus manufactured: Controllers, both manual and magnetic switch types for all purposes; lifting magnets, electric brakes; magnetic switches; arc welders, crane fittings, etc.




PLUNGER CORE MACHINE

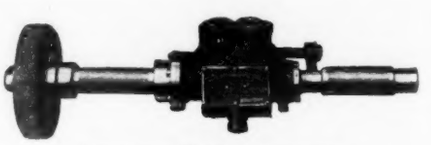
## PLUNGER CORE MACHINE.

The plunger core machine, shown in the accompanying illustration, is equipped with a positive feed hopper, operates without the use of a screw and is adapted for making stock cores, round, square or irregular shapes, from ⅜-inch to 3 inches. Small cores ⅜ to 1 inch in diameter are made two at a time, thus doubling the capacity of the machine on these sizes. Multiple dies are also provided for making such small cores as are used in malleable foundries.

These dies will make the following number of cores of various sizes in one operation: Three ¾-inch, three ⅝-inch, four ½-inch, five ⅜-inch, six 5/16-inch and eight ¼-inch. When operating the machine, the material is shoveled into the hopper and the gate is set according to the size of the core to be made. When revolving the fly wheel the hopper feeds the material into the mixer and the swiper then feeds the sand into the dies and the plunger moves it forward through the tubes. The operating parts of the hopper are enclosed and the guides are fastened underneath the bed, which prevents the sand from working into the operating parts. When extra dies are used special cutters are provided for cutting the cores the required length. This machine has a capacity for making 2,000 cores, 5/16 x 3 inches, per hour. When power driven, the tendency to break the core is overcome by the quick return motion of the plunger. The machine, which can be successfully used for making cores from almost any grade of sand, including cement mixtures, is manufactured by the Diamond Clamp Flask Co., Richmond, Ind.

## PORTABLE EMERY GRINDER.

The portable emery grinder shown herewith, manufactured by The Cleveland Pneumatic Tool Co., Cleveland, is adapted to grinding fins and risers from iron and steel castings, as well as uneven edges of steel plate in structural or ornamental iron work. This machine will grind a 6-inch emery wheel with a 1¼-inch face as maximum size. It has a speed of 2,400 revolutions per minute, running light at 80 pounds air pressure and uses 20 cubic feet of air per minute. The length over all, including throttle handle to the tip of the arbor is 22¼ inches, and its gross weight is 17½ pounds. Locked in a vise this portable machine becomes a permanent grinder for edging small tools. A wire wheel brush can be used in place of the emery wheel for removing sand or metal scale from



PORTABLE EMERY GRINDER

corners or cavities in castings not otherwise accessible. With a felt wheel attached it can be used in buffing and polishing bright metal surfaces.

## A PORTABLE PNEUMATIC MOLDING MACHINE.

A positive pressure pneumatic molding machine possessing many commendable features is shown in the accompanying illustration. It consists essentially of a light, stiff, cast iron frame to which are bolted four upright rods, each about 4 feet long, which in turn carry the air cylinder and pressure producing mechanism. The machine is made easily portable by mounting it on four cast iron wheels and can be readily moved along the floor as the day's work progresses. In the operation of the machine, air at a pressure of 100 pounds per square inch is admitted to the cylinder through a special valve, which gradually applies the pressure to the mold. The positive travel can be adjusted thus insuring absolutely uniform ramming. This feature is of great value in duplicating molds from the same pattern. Another feature of the machine is that the patterns require no special mounting. Ordinary patterns such as are used in hand molding can be employed on this machine. It is so designed, however, that a stripping bolt can also be used to advantage.

In Fig. 1 is shown the method of ramming up the drag part of the flask when a match board or sand match is used, and in Fig. 2 the cope is being rammed. In Fig. 3. both cope and drag are being rammed in one operation, the pattern being mounted on a plate. This machine is made in two sizes, 30 and 36 inches, and is manufactured by the James F. Webb Mfg. Co., Davenport, Iowa.

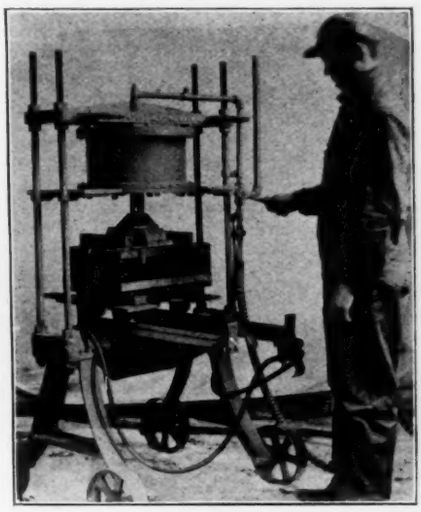


FIG. 1—RAMMING DRAG WHEN MATCH BOARD OR SAND MATCH IS USED

FIG. 2—RAMMING COPE WHEN MATCH BOARD OR SAND MATCH IS USED

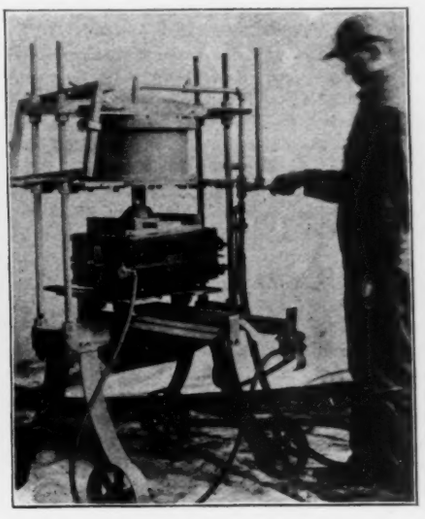


FIG. 3—RAMMING BOTH COPE AND DRAG IN ONE OPERATION, THE PATTERNS BEING MOUNTED ON A PLATE

## TRADE PUBLICATIONS.

FOUNDRY SUPPLIES.—Bulletin No. 18, issued by the J. W. Paxson Co., Philadelphia, contains 44 pages and is entitled "Paxson's Freight Lines." This concern ships all of its foundry sand from its banks in its own bottoms to consumers along the Atlantic coast. The fleet includes seven steam barges, 11 towing barges and three ocean-going tugs. The bulletin is handsomely illustrated and contains views of several of these boats. The various grades of molding sands mined and shipped are described and their uses clearly outlined for every branch of foundry work. The molding sands for steel foundry use are likewise extensively reviewed and this section of the bulletin should prove invaluable to every steel foundryman. Several pages are also devoted to the use of alloys and fluxes. Core room equipment, core washes, compounds, binders, fire brick, furnace linings, and other foundry supplies are also treated at length.

FOUNDRY EQUIPMENT.—A booklet 6 x 9 inches, containing 30 pages, designed especially for distribution at the convention of the American Foundrymen's Association, recently held in Toronto, is now being sent to the foundry trade in general by the Whiting Foundry Equipment Co., Harvey, Ill. This second edition is necessary owing to the favor with which the souvenir was received at this meeting. The complete line of foundry equipment manufactured by this concern is described and the illustrations show the application and arrangement of traveling and jib cranes, tumbling mills, core ovens, pneumatic crane and Moyer tramrail systems. Special attention is also directed to the automatic cupola charging machine, which is already in successful use in a number of large foundries, and which is operated by compressed air. The Whiting Foundry & Equipment Co. also publishes a general catalog, in which all of the various machines and appliances referred to in this foundrymen's reference book are described in greater detail.

GRINDING.—The Norton Co., Worcester, Mass., in a recently issued pamphlet gives some pertinent hints regarding the proper selection of emery wheels, their uses, mounting, and correct speeds.

CRUCIBLE FURNACES.—The Kroeschell Brothers Co., Chicago, has issued a leaflet illustrating and describing its line of gyrating flame crucible furnaces. The capacity and oil or gas consumption of the furnace is given, together with data on continuous operation, number of heats per day, blast pressure, etc.

SHAFTING.—The Coates Clipper Mfg. Co., Worcester, Mass. Bulletin No. 21. This bulletin illustrates and describes a line of flexible shafting, giving numerous examples of the uses to which it may be put. The shafting is described as a series of ball and socket links, made of crucible steel. Prices of the various sizes are given. Among the many applications illustrated are portable grinding machines, chipping, drilling and scouring devices, electric-driven through flexible shafting by motors set on the floor.

GAGES.—The Standard Gage Mfg. Co., Syracuse, N. Y., bulletin No. 2, recently issued, contains descriptions and prices of standard pressure and vacuum gages.

THERMOMETERS.—In bulletin No. 92, the Bristol Co., Waterbury, Conn., describes its line of recording thermometers and also gives a list of accessory parts, including standard bulbs, charts and sundries.

HOISTING MACHINERY.—The Brown Hoisting Machinery Co., Cleveland, in a recently issued booklet illustrates and describes several designs of "Brownhoist" coal handling apparatus specially designed for electric light, artificial gas and coke companies. The apparatus described are all standard and the book is worthy of perusal by everyone interested in coal handling machinery.

AIR HOISTS.—A detailed description of the new line of air hoists, specially designed for foundry purposes, is contained in a pamphlet recently issued by the Calumet Engineering Works, Harvey, Ill.

FANS.—A booklet containing illustrations, dimensions and prices of electric driven ventilating fans is being distributed by the Massachusetts Fan Co., Watertown, Mass. This booklet also contains some interesting tables giving the horsepower consumed and quantity of air delivered by the different sizes of Davidson fans when run at varying rates of speed.

# GENERAL INDUSTRIAL NOTES

The National Brake & Electric Co., Milwaukee, Wis., formerly the National Electric Co., will begin at once the erection of core and annealing ovens at its plant on Larkin street. The annealing house will be of brick and its cost is estimated at $10,000.

Wessling Bros., Cincinnati, purchased the plant of the Weber Bros. Foundry Co., of that city, for $15,000, and have taken over the entire business except the book accounts. The Wesslings formerly owned this foundry, which has been operated for some time by the Webers when they failed last December with liabilities of $44,000. The plant has been idle for some months, but the new owners expect to begin a jobbing foundry business at once.

The American Cast Iron Pipe Co., Birmingham, Ala., recently completed and placed in operation its department for making large size pipe. This addition will increase the company's output about 40 per cent.

E. E. Linthicum, formerly general manager of the American Cast Iron Pipe Co., Birmingham, Ala., will establish a new plant for the manufacture of high pressure pipe in Anniston, if the citizens there will raise $75,000 capital, in addition to $50,000 which Mr. Linthicum will furnish. The chamber of commerce has accepted his proposition and has appointed a commitee to solicit subscriptions.

The Holbrook-Armstrong Co., Racine, Wis., will use the foundry building it recently purchased from the Herrick estate principally for the manufacture of brass and aluminum castings and has installed three brass furnaces and one aluminum furnace. Iron castings may also be made, but the company has a large iron foundry in another part of its plant. The Holbrook-Armstrong Co. now has one of the most modern foundries in the state.

The plant of the Herron Pump & Foundry Co., Chattanooga, Tenn., has been sold to Chas. A. Lyerly, of that city, for $27,000. A new company will be organized to take over and operate the plant.

The American Malleables Co., New York City, has not yet made any plans for rebuilding its plant at Bloomfield, N. J., which was recently destroyed by fire.

The Conklin Stove Mfg. Co., Columbus, O., has been organized with a capital of $35,000 to conduct a stove foundry. The incorporators are J. W. Hastings, E. A. Evans, F. M. Haberkorn, Patrick Carroll and Barbara Haberkorn.

The Kellogg-Mackay-Cameron Co., of New York, De Witt, N. Y., has been granted a charter to manufacture boilers, radiators, pipe fittings, etc., with an authorized capital of $1,500,000. The incorporators are Adam N. Theobald and Irving N. Trangott, Syracuse, N. Y., and C. Borney, Salisbury, N. Y.

The Lebanon Foundry Co. has been organized and will establish a plant at Lebanon, Pa. The capital stock is $50,000 and the directors are: G. W. Norwood, W. J. DeVol, Phil Adler, W. S. Ritchie, C. A. Gillhan, J. H. Hoy and J. L. Wallace.

A. W. Severance has sold the machine shop and foundry at Walla Walla, Wash., to C. J. Broughton.

The New Western Foundry Co., Kansas City, Mo., has been incorporated by W. H. Sanford, W. A. Sanford and E. M. Miller, with a capital stock of $20,000.

The H. G. Trout Co., Buffalo, N. Y., has been incorporated to take over the business of H. G. Trout and the King Iron Works. The capital stock is $60,000 and the directors are H. G., W. B., and Lillian G. Trout, H. G. Walker and W. Mummery, all of Buffalo.

Sargent & Son, Castleton, Vt., manufacturers of plows, and Osgood & Roundy, general founders of Randolph, Vt., have consolidated and will in future operate only one plant, but have not yet decided on its location.

The plant of the A. A. Griffing Iron Co., Jersey City, N. J., which was recently sold at chancellor's sale to the Hematite Products Co., has been transferred to the American Radiator Co., and will be used as a warehouse. The Griffing Co. has been in the hands of a receiver since early in March. It is stated that the purchase price, $110,000, will more than cover the liabilities.

Owing to the heavy demand for its basin cocks, the Fowler Brass Works, Chicago, is operating its brass foundry two shifts and is employing a night and day crew.

The American Roll & Foundry Co., Canton, O., has recently made the following important changes in its management: James O. Barnett, formerly manager of the Vandergrift plant of the United Engineering & Foundry Co., has been made manager and treasurer, and N. Austin, formerly a roll maker at the Vandergrift plant, has taken charge of the roll department. Mr. Quinn, who was with the Frank-Kneeland department of the United Engineering & Foundry Co., has been made superintendent. The American Roll & Foundry Co. manufactures all classes of rolling mill machinery and reports a fair amount of orders now on hand, with brighter prospects for the immediate future.

---

## New Construction.

The Federal Castings Co., Vincennes, Ind., has incorporated with a capital stock of $250,000, and the following directors have been elected: Henry C. Atkins, Henry C. Price, James C. Curtis and William Hecht, of Indianapolis; Lee Herman, Muncie, Ind.; Sidney Smith, Louisville, Ky.; George P. Altenberg, Cincinnati; C. Brooks Buckley and George S. Cotter, Springfield, O. The company will build a plant for the manufacture of all kinds of castings, also railroad, industrial and mining cars and appliances for railroad shops. Two buildings, 100 x 300 feet and 50 x 240 feet, respectively, of brick and steel, with concrete foundations, will be erected at once. The company is expected to duplicate these within three years and invest $70,000 in addition to the $30,000 capital furnished by the city of Vincennes.

The Southern Wisconsin Foundry Co., Madison, Wis., which was recently incorporated with a capital stock of $25,000, has elected the following officers: President, George C. Riley; vice president and superintendent, Henry A. Knabe; secretary and treasurer, H. M. Vance. It will use the foundry building now occupied, which is 40 x 100 feet, for storage purposes, and will erect a new plant on a site already purchased. The buildings will include a molding shop, 60 x 100 feet, pattern shop, 25 x 50 feet, and additions for core room, cleaning room and cupolas. The plant will be equipped with gasoline engines for motive power, electric generator, two cupolas, two cranes for handling castings up to 12 tons, and other modern machinery. Both gray iron and brass castings will be produced.

The Erie Foundry Co., Erie, Pa., has partly completed plans for rebuilding its plant, which was recently destroyed by fire. Plans for its new pattern and storage shops have already been made, but those for the new foundry are not yet completed.

The Deemer Steel Casting Co., New Castle, Del., has been organized by Selden S. Deemer and others, with a capital stock of $250,000. The new company has secured a site with a frontage of 837 feet on the Delaware river, and is preparing plans for a plant for the manufacture of steel castings by the Deemer improved surface blown Bessemer converter process. This it hopes to have in operation within a year. Mr. Deemer's experience in the manufacture of steel castings has been extensive, as he was for 20 years with the Chester Steel Castings Co., and for the past eight years has been superintendent of the Brylgon Steel Casting Co.

The Independent Stove Co., Detroit, Mich., has increased its capital stock from $60,000 to $175,000 and is erecting a new foundry in Owosso, Mich. The main building will be 74 x 190 feet, with storage building, 62 x 173 feet. A new 60-inch Colliau cupola will be installed, in addition to the company's present equipment, which will be removed to Owosso when the new plant is completed. The working force will be increased from 55 to 75 men.

T. H. Symington & Co., Corning, N. Y., will erect a new foundry, 400 x 700 feet, with pattern and carpenter shops, for the manufacture of journal boxes and other railroad specialties. Plans for its location and construction are not yet completed, however, as several points are under consideration.

The Buckeye Steel Castings Co., Columbus, O., expects soon to add another furnace to its plant and will probably have the additions now under construction in operation some time in the fall.

The Bonnet-Nance Stove Co., Chicago Heights, Ill., is preparing plans for an addition to its manufacturing plant, to cost $40,000. It will be two-story, 100 x 200 feet, of brick and steel construction, with concrete foundation.

The Progressive Stove & Furnace Co., Colorado City, Colo., is completing a new store room, 40 x 70 feet. An addition to the foundry room, 40 x 50 feet, will be commenced at once, and a Cunningham brass furnace will be installed. Orders for a satisfactory quantity of brass castings are being steadily received.

The Erie Stove & Mfg. Co., Erie, Pa., will erect a two-story brick building 42 x 133 feet, and equip it for factory purposes.

# Index to Volume XXXII

## March 1908—August 1908


Accidents, Society for Prevention of..... 45
"Accidents, Their Causes and Remedies" —Book Review ..... 207
Adams Pneumatic Rapper, The..... 104
Advantages of Core Molding..... 7
Air and Annealing Furnaces..... 189
Air Furnaces, Coal Consumption of..... 191
Allegheny Valley Malleable Iron Co., Plant of ..... 189
Alloy for Iron and Steel Castings..... 16
Aluminum in Cast Iron..... 278
American Brass Founders' Association, Convention of ..... 235
American Brass Founders' Association, Secretary's Report ..... 237
American Foundrymen's Association, Preparations for Toronto Convention..... .....38-75-136-197-202
American Foundrymen's Association, Report of Secretary ..... 228
American Foundrymen's Association, Toronto Convention .....27-227-268
American Manganese Bronze Co., Organization of ..... 265
American Wood Working Machinery Co.—Pattern Shop Lathe ..... 149
Annealing Castings ..... 239
Annealing Steel Castings ..... 92
Antimony ..... 267
Arbors, Large Cores Without..... 15
Arcade Mfg. Co., Molding Machines..... 203
Australian Notes ..... 183
Automobile Cylinders, Production of..... 261

Babbitt Metal Dross ..... 260
Baillot Cupola, The ..... 205
Ballou's White Sand Co., New Plant of.. 80
Band and Fly Wheels, Splitting Plates for 135
Bassite—A Substitute for Tin in Brass Mixtures ..... 178
Batcheller, Clark & Batcheller, Inc.—The Danic Sand Blast ..... 207
Baths, Electro-Chemical, for Brass Castings ..... 217
Bearing Metal ..... 29
Beckwith, P. D., Estate of—Stove Foundry ..... 107
Berkshire Mfg. Co.—Molding Machine.... 150
Birmingham Branch of British Foundrymen's Association ..... 14
Blake & Knowles Steam Pump Works—New Vertical Pump ..... 151
Blast Pressures, Cupola, A Study of..... 287
Blower, Compound Pressure ..... 269
Blow Holes, Alloy for Prevention of..... 16
Blow Holes Around an Iron Chill Rod... 23
Blow Holes in Automobile Cylinders..... 89
Borings, Cast Iron, Use of..... 186
Bougher, J. K.—Obituary..... 43
Brake Shoe Scrap in Cast Iron..... 186
Brass Borings, Melting ..... 91
Brass Castings, Electro-Chemical Cleaning Bath for ..... 217
Brass Castings, Recovering Grinding Dust from ..... 188
Brass Castings, Sand for Heavy..... 37
Brass Castings, Tarnished ..... 93
Brass Castings, Thin ..... 245
Brass Castings, Yellow, Shrinkage of..... 45
Brass Founding, Cupola for..... 10
Brass Foundry Practice, Value of Liquid Fuel in ..... 277
Brass Foundry, The Jobbing (IV)..... 279
Brass Foundry, The, Silicon-Copper in.... 1
Brass Foundries, Novel Method of Handling Metal in ..... 137
Brass Mixtures ..... 191
Brass Mixtures, Use of Bassite in..... 178
Brass Plant, Model Canadian..... 175
Brass Scrap, Use of ..... 105
Brass, Yellow, High Pressure Mixtures.. 283
British Foundrymen's Association.....115-196
British Foundrymen's Association, Birmingham Branch ..... 14
Bronze Age, The, Metallurgy of..... 218
Bronze Alloy, High Tensile ..... 172
Bronze Casting Made of Hard and Soft Metal ..... 93
Bronze, Effect of Silicon-Copper on..... 3
Bronze, Manganese ..... 301
Bronze, Manganese, Melting ..... 286
Buckets, Dump ..... 102
Bucyrus Steel Casting Co., Plant of..... 82
Buffalo Forge Co. Compound Pressure Blower ..... 269

Calumet Engineering Works, The Calumet Cupola ..... 101
Canadian Brass Plant, A Model..... 175
Capacity of Ladles, Measuring..... 11
Car Wheel Chill ..... 27
Car Wheel Foundry, Straight Floor..... 211
Car Wheels, Cast Iron, Standard Specifications for, Data Sheets Nos. 13, 14 and 15, March and April, 1908.....
Car, B. M., Patent Car Wheel Chill..... 27
Cast Iron, Aluminum in ..... 278
Cast Iron, Effect of Different Alloys on 266
Cast Iron, Micro-Constituents of..... 41
Cast Iron Notes.....34-89-185
Cast Iron Pipe and Special Castings, Standard Specifications for, Data Sheets Nos. 19, 20, 21, 22, 23, 24, June, July and August, 1908.
Cast Iron, Titanium in..... 240
Cast Iron to be Machined, Specifications for ..... 223
Cast Iron, Vanadium in, Tests of..... 17
Casting, Long Machine Tool ..... 40
Casting, Molding a Difficult..... 4
Casting Nickel ..... 172
Casting Pipe in Permanent Molds..... 138
Castings, Alloy for Iron and Steel..... 16
Castings, Annealing ..... 239
Castings, Chilled ..... 35
Castings, Chilled, Pin Holes in ..... 29
Castings, Hard, for Dies..... 87
Castings, Heavy and Light From One Heat 185
Castings, Malleable, Without Annealing... 22
Castings, Ornamental Gray Iron..... 63
Castings, Pile Driver ..... 298
Castings, Porous Surface in Plated..... 89
Castings, Sections of Large Cylindrical, Equipment for Sweep Molding..... 20
Castings, Small Gray Iron, Mixtures for 34
Castings, Special, Specifications for, Data Sheets Nos. 19, 20, 21, 22, 23, 24, June, July and August, 1908,
Castings, Unsound ..... 185
Castings, White Iron ..... 89
Castings, Yellow Brass, Shrinkage of..... 45
Chain Block Hoist, Improved..... 306
Charging Machine for Cupolas..... 66
Chase Foundry & Mfg. Co., Mold Drying, Annealing and Core Car ..... 208
Chemical Reactions in Cupola Practice.... 296
Chicago Foundry Foreman, Second Annual Exhibit of Foundry Equipment...28-69
Chill for Car Wheels ..... 27
Chilled Castings ..... 35
Chilled Mold Boards ..... 137
Cleveland Pneumatic Tool Co., Portable Emery Grinder ..... 308
Chilled Rolls ..... 187
Clam-Shell, Cast Steel, Molding a..... 55
Classification of Patterns..... 163
Cleveland Tumbling Barrel ..... 209
Coal, Consumption of, Air Furnaces..... 191
Coates Clipper Mfg. Co., One-Part Unit Flexible Shaft ..... 226
Coke Pocket, A Reinforced Concrete..... 299
Columbia University Students, Study of Cupola ..... 6
Commercial Piracy ..... 39
Commutator Segment Castings, Difficulties With ..... 129
Converter vs. Small Open-Hearth—IV.... 81
Converter vs. Small Open-Hearth—V..... 295
Core Arbor, Expansion of Heavy, Difficulties Resulting From ..... 29
Core Box Machine, The Circular Saw as a 294
Core Cutting-Off and Coning Machine.... 98
Core Machine, Automatic ..... 46
Core Machine, Plunger ..... 270
Core Making ..... 248
Core Molding, Advantages of ..... 7
Core Ovens for Light and Heavy Work... 58
Core Print Question, Discussion of With Patternmaker ..... 133
Core Wire Cutting Machine, Gregg Mfg. Co., Cleveland ..... 307
Cores, Large, Without Arbors..... 15
Cores, Metal, in the Foundry..... 36
Cost Keeping Methods, English..... 94
Cost System, Practical Foundry..... 121
Cost System, Uniform Foundry..... 284
Crane Cylinder, Molding a Steam..... 168
Crucible Tongs, Device for Shaping..... 46
Crucibles, Prolonging Life of..... 245
Cupola Blast Pressures, a Study of..... 287
Cupola Blower Set, Turbine..... 99
Cupola, Charging a ..... 185
Cupola Charging Machine..... 66
Cupola, More Than One Kind of Iron From One ..... 185
Cupola, Operation and Care of..... 126
Cupola Practice, Chemical Reactions in.. 296
Trade Outlook ..... 304
Cupola, The Baillot ..... 205
Cupola, The Calumet ..... 101
Cupola, The, in Brass Founding ..... 10
Cupola Slag ..... 303

Cylinder, for Steam Crane, Molding..... 168
Cylinders for Automobiles, Production of. 261
Cylinders, Heavy, Mixture for..... 303
Cylinders, Leaky ..... 186
Cylinders, Locomotive, Standard Specifications for, Data Sheet No. 16, April, 1908.
Cylindrical Section Sweeping Device..... 20

Detroit Foundry Supply Co., Woodison Crucible Oil Furnace ..... 209
Detroit Foundrymen's Association.....137-226
Diamond Clamp & Flask Co., Automatic Core Machine ..... 46
Diamond Clamp & Flask Co., Plunger Core Machine ..... 308
Dickson Car Wheel Co., Plant of..... 211
Dies, Hard Castings for ..... 87
Discussion of the Core Print Question With the Patternmaker ..... 133
Dissatisfaction, A Frequent Cause of in Foundry Practice ..... 304
Dixon, Jos., Crucible Co., Device for Shaping Crucible Tongs ..... 46
Dome Casting, Method of Molding..... 128

Electro-Chemical Cleaning Baths and Their Application to Commercial Uses..... 217
Engine Frame, Molding a Large..... 51
English Institute of Metals..... 301
Erection and Equipment of Modern Foundry ..... 193
Erie Foundrymen, Banquet of..... 135
Examinations of Molding Sands, Relative Values of Physical and Chemical..... 224
Exhausters, Massachusetts Ball Bearing.. 98
Expansion of Heavy Core Arbor, Difficulties Resulting From ..... 29

Fans for Blowers, Proportions of ..... 42
Ferro-Alloys in the Foundry..... 266
Ferro-Silicon for Malleable Heats..... 35
Flask Bar, Adjustable ..... 49
Flask Recording System, A Simple..... 300
Flour City Ornamental Iron Works, Foundry of ..... 63
Flux for Sash Weight Iron ..... 35
Fluxes for Soft Metals ..... 29
Foundation Plate, Narrow, Molding of.. 131
Foundry, A Gray Iron Jobbing..... 31
Foundry, Brass, Silicon-Copper in the.... 1
Foundry, Car Wheel, Straight Floor.... 211
Foundry Convention Idea ..... 200
Foundry Cost System, A Practical..... 121
Foundry Cost System, A Uniform..... 284
Foundry Equipment, Exposition at American Foundrymen's Association Convention, Toronto ..... 249
Foundry Equipment, Second Annual Exhibit of Chicago Foundry Foremen....28-69
Foundry, Ferro-Alloys in ..... 266
Foundry Irons, Micro-Structure of..... 289
Foundry, Modern, Erection and Equipment of ..... 193
Foundry Practice, A Frequent Cause of Dissatisfaction in ..... 304
Foundry Records, System for Keeping... 221
Foundry, Use of Metal Cores in..... 36
Foundry Warehouse Methods..... 221
Foundry Work, Sand Blast for..... 271
Foundry Work, Science Applied to..... 130
Foundries, Iron, Steel, Malleable and Brass, in United States and Canada.. 242
Fuel, Value of Liquid in Brass Foundry Practice ..... 277
Furnace Castings, Iron for..... 89
Furnace, Oil, Woodison Crucible..... 209
Furnace, Kroeschell-Schwartz Gyrating Flame Crucible ..... 306
Furnaces, Novel Air and Annealing..... 189

Galvanizing Barrel, Automatic ..... 96
G. & W. Mfg. Co., Ball Trolley System.. 150
G. & W. Mfg. Co., Flexible Industrial Railway for the Foundry..... 208

Glue Pot, Electric, General Electric Co.'s. 152
Glue Pots, Electrically Heated..... 99
Gould, Frank W.—Obituary..... 42
Goulds Mfg. Co., Cost System for Foundry ..... 121
Graphite Deposits in Alaska..... 48
Gray Iron Jobbing Foundry..... 31
Gregg Mfg. Co., Core Wire Cutting Machine ..... 307
Grinding Dust, Recovering..... 188
Grinder, Portable Emery, Cleveland Pneumatic Tool Co..... 308

Hamilton Foundry & Machine Co.'s Gray Iron Foundry ..... 31
Handling Metal in Brass Foundries, Novel Method of ..... 137
Hanna Engineering Works, Rotary Dumping Sand Riddle ..... 104
Hauck Mfg. Co., Portable Heaters.....149-209
Heater, Portable ..... 306
Hoist, Electric Chain Block..... 206
Holmquist, Actiebolaget Malcus, Plunger Core Machine ..... 270

Industrial Notes, General....50-106-154-210-272
Heaters, Portable ..... 209
Institute of Metals, English..... 301
Institute of Metals, Formation of.....94-127
Iron, Difficulties Experienced in Mixing Different Grades ..... 5
Iron, Hard, From Small Cupola..... 35
Iron, Hard Spots in..... 188
Iron, High Sulphur ..... 34
Iron in Ladles, Measuring ..... 11
Iron, Steel, Malleable and Brass Foundries in the United States and Canada..... 242
Iron, Wrought, Use in Mixture..... 45
Irons, Foundry, Micro-Structure of..... 289

Jobbing Brass Foundry, The (IV)..... 279
Jobbing Steel Foundry Practice..... 82

Kilbourne & Jacobs Mfg. Co., Dump Buckets ..... 102
Kilbourne & Jacobs Mfg. Co., Pans and Tote Boxes for Factories ..... 46
Killing Molding Machine Co., Motor-Driven Universal Saw Table ..... 97
Killing Roll-Over Molding Machine..... 104
King Radiator Co., Ltd., Plant of..... 155
Kroeschell-Schwartz Gyrating Flame Crucible Furnace ..... 306

Ladles, Measuring the Capacity of..... 11
Ladles, Measuring the Capacity of, and Ascertaining the Amount of Iron Contained, Data Sheets No. 17 and 18, May, 1908.
Ladwig Skim Gate ..... 153
Lathe and Gear Cutting Machine, Combination ..... 102
Lathe, Pattern Shop ..... 149
Leiman Bros., Sand Blast for Foundry Work ..... 271

Machine-Molded Stove Plate ..... 107
Malleable Castings, Air and Annealing Furnaces for ..... 189
Malleable Castings Annealed in Scale and Charcoal ..... 192
Malleable Castings, Cracking of..... 135
Malleable Castings for Automobiles..... 94
Malleable Castings, Making Without Annealing ..... 22
Malleable Castings, Mixtures and Furnace Charges ..... 173
Malleable Castings, Mixtures for..... 117
Malleable Castings, Over-Annealed..... 95
Malleable Castings, Physical and Chemical Properties ..... 24
Malleable Castings, Production of (II)... 24
Malleable Castings, Production of (III).. 60
Malleable Castings, Production of (IV).. 117
Malleable Castings, Production of (V)... 173
Malleable Castings, Production of (VI).. 273
Malleable Castings, Specifications for..... 62
Malleable Castings, Testing of..... 60
Malleable Castings, Tinned ..... 186
Malleable Heats, Ferro-Silicon for..... 35
Malleable Mixtures ..... 45
Manganese Bronze ..... 301
Manganese Bronze, Melting ..... 286
Manganese, Effect of, in Manganese Bronze 177
Manganese Resistance Metal ..... 54
Manganin ..... 6
Massachusetts Fan Co., Massachusetts Ball Bearing Exhauster ..... 98
Measuring the Capacity of Ladles..... 11
Metal, Acid-Proof ..... 23
Metal, Alkali-Proof ..... 16
Metal, Bearing ..... 29
Metals, Soft, Fluxes for ..... 29
Metallurgy of the Bronze Age..... 218
Micro-Constituents of Cast Iron..... 41
Micro-Structure of Foundry Irons..... 289
Milwaukee Correspondence School, Establishment of ..... 120
Milwaukee Foundry Foremen..... 188
Mississippi Valley Foremen, Organization of ..... 148
Mitchell-Parks Mfg. Co., Adjustable Flask Bar ..... 49
Mixing Different Grades of Iron, Difficulties of ..... 5
Mold Boards, Chilled ..... 137
Mold Drying, Annealing and Core Car... 208
Molds, Effects of Steam in..... 52
Molds, Heater for Skin Drying..... 48
Molding a Cast Steel Clam-Shell..... 55
Molding a Difficult Casting..... 4
Molding a Dome Casting ..... 128
Molding a Large Engine Frame..... 51
Molding a Narrow Foundation Plate..... 131
Molding a Steam Crane Cylinder..... 168
Molding, Core, Advantages of..... 7
Molding Machine, Cleveland Squeezer.... 207
Molding Machine, Improved Berkshire.... 150
Molding Machine, Killing Roll-Over..... 104
Molding Machine, Pneumatic Roll-Over... 96
Molding Machine, The, Advance of..... 146
Molding Machines, Fitting Patterns to... 180
Molding Machines for Stove Plate..... 108
Molding Machine, Tabor Jarring..... 305
Molding Machines, Rock-Over and Automatic ..... 203
Molding Sands, Analysis of..... 224
Molding Sands, Relative Values of Physical and Chemical Examinations ..... 224
Monel Metal ..... 48

New England Foundrymen's Association... 33
Nickel, Difficulties in Casting ..... 303
Nickel, Casting ..... 172
Northern Engineering Works, Electric Chain Block Hoist ..... 206

Obermayer Bulletin ..... 270
Obituary .....95-147
Oil Burner, Portable, for the Foundry... 149
Ornamental Gray Iron Castings..... 63

Pattern Shop System, Practical..... 77
Patterns, Classification of ..... 163
Patterns, Discussed From a Foundry Point of View ..... 160
Patterns, Errors in Design of..... 160

Patterns, Fitting to Molding Machines.... 180
Patterns for Cast Steel Clam-Shell..... 55
Patterns, Simple Method for Recording... 77
Patterns, Spacing and Mounting ..... 180
Patterns, System for Recording..... 163
Patternmaker, Practical, Suggestions From 39
Paxson, J. W., Co., Reorganization of.... 80
Personals .....44-94-147-201-269
Philadelphia Conference on Short Weights 37
Philadelphia Foundrymen's Association... 45
Phosphor-Bronze Rings ..... 179
Piano Plates, Iron for..... 90
Pile Driver Castings ..... 298
Pin Holes in Chilled Castings..... 29
Pipe, Casting in Permanent Molds..... 138
Pipe, Continuous Process of Making..... 138
Piracy, Commercial ..... 39
Pitch, Use of ..... 167
Pittsburg Foundrymen's Association, Meeting of ..... 19
Planer, Large Open Side, Built by Cleveland Planer Works ..... 40
Plunger Core Machine, Diamond Clamp & Flask Co.'s ..... 308
Prize Contest Awards ..... 43
Production of Malleable Castings (II).... 24
Production of Malleable Castings (III).. 60
Production of Malleable Castings (IV).. 117
Production of Malleable Castings (V).... 173
Production of Malleable Castings (VI)... 273
Pump Castings, Core Molding for..... 8
Pump, Vertical Steam ..... 151

Radiator Practice, Latter-Day ..... 155
Railway, Flexible Industrial, for the Foundry ..... 208
Rat-Tailing and Other Difficulties Experienced by the Sunnysides Foundry & Machine Co. ..... 30
Reed, M. C. J., Patent Bearing Metal.... 29
Reed Magnetic Separator ..... 105
Riddle Sand, Rotary Dumping..... 104
Rings, Packing, Mixture of Iron for..... 185
Rings, Phosphor-Bronze ..... 179
Rockwell Portable Heaters..... 48
Roll Cleaning Device ..... 41
Roll, Large, Molding With Sectional Core of Eight Parts ..... 15
Rolls, Chilled .....187-201

Sand Blast for Foundry Work..... 271
Sand Blast, the Danic..... 207
Sand for Motor-Cycle Cylinders..... 239
Sandwiched Hard Spots ..... 188
Saw Table, Motor Driven Universal..... 97
Saw, The Circular, as a Core Box Machine ..... 294
Science Applied to Foundry Work..... 130
Scrap Pile Argument ..... 90
Screen Plates for Paper Mills..... 260
Semi-Steel Mixtures and Methods of Calculating the Charges ..... 166
Separator, Magnetic ..... 105
Shaft, Flexible, One-Part Unit ..... 226
Silicon-Copper in the Brass Foundry.... 1
Skim Gate, Ladwig ..... 153
Slag, Foaming ..... 35
Sly, W. W., Mfg. Co., Combination Lathe and Gear Cutting Machine ..... 102
Sly, W. W., Mfg. Co., Large Continuous Tumbling Mill ..... 152
Smith, J. D., Foundry Supply Co., Cleveland Squeezer ..... 207
Somerville, Ltd., Brass Foundry of..... 175
Specifications for Cast Iron to be Machined 223
Splitting Plates for Band and Fly Wheels 135
Standard Specifications for Cast Iron Car Wheels, Data Sheets Nos. 13, 14 and 15, March and April, 1908.
Standard Specifications for Cast Iron Pipe and Special Castings, Data Sheets Nos. 19, 20, 21, 22, 23 and 24, June, July and August, 1908.
Standard Specifications for Locomotive Cylinders, Data Sheet No. 16, April, 1908.
Steam in Molds, Effects of..... 52
Steel Castings, Annealing of..... 92
Steel Castings, Converter vs. Small Open-Hearth Furnace for ..... 81
Steel Foundry Practice, Jobbing ..... 82
Steel in Brake Shoe Scrap ..... 186
Stevenson, Arthur B., Obituary..... 44
Stove Plate, Machine-Molded ..... 107
Stove Trade, Canadian, Three Pioneers of 196
Sturtevant, B. F., Co., Turbine Cupola Blower Set ..... 99

Table Showing the Capacity of Ladles at Each Inch of Their Depth, Data Sheets Nos. 17 and 18, May, 1908.
Tabor Mfg. Co., Jarring Molding Machine 305
Tabor Mfg. Co., Pneumatic Roll-Over Molding Machine ..... 96
Test Bars, Figuring Strength of Castings From ..... 169
Test Bars, Memorandum on ..... 169
Tests of Vanadium in Cast Iron..... 17
Tin in Brass Mixtures, Substitutes for... 178
Titanium in Cast Iron..... 240
Tool Builders on Foundry Work..... 202
Toronto Testing Laboratory, Organization of ..... 96
Tote Boxes and Pans for Factories, Kilbourne & Jacobs Mfg. Co..... 46
Trade Notes .....47-103-147-201-270
Trade Outlook .....42-94-146-268
Trade Publications .....49-105-153-209-271
Trolley System, Ball ..... 150
Tumbling Barrels, Cleveland ..... 209
Tumbling Mill, Large Continuous..... 152

United States Galvanizing Co., Automatic Galvanizing Barrel ..... 96

Vanadium ..... 278
Vanadium in Cast Iron, Tests of..... 17
Victor Metal ..... 239

Wadsworth Core Cuting-Off and Coning Machine ..... 98
Warping of Castings ..... 185
Weights, Short, Philadelphia Conference on 37
Western Foundrymen's Association, Organization of ..... 193
Westinghouse Electric & Mfg. Co., Electrically Heated Glue Pots..... 99

# *Author's Index to Volume XXXII*

## *March 1908—August 1908*

Ackboy, L. B. A Few Suggestions From a Practical Patternmaker ..... 39
Anderson, W. S. Operation and Care of the Cupola ..... 126

Best, W. N. Value of Liquid Fuel in Brass Foundry Practice ..... 277
Bolton, Albert E. Splitting Plates for Band and Fly-Wheels ..... 135
Brandon, G. R. Charging Machine for Cupolas ..... 66
Buchanan, George. Use of Metal Cores in the Foundry ..... 36
Buchanan, J. F. Advantages of Core Molding ..... 7
Buchanan, J. F. The Jobbing Brass Foundry (IV) ..... 279

Carr, W. M. Annealing Castings..... 239
Carr, W. M. Converter vs. the Small Open-Hearth—IV ..... 81
Carr, W. M. The Converter vs. the Small Open-Hearth—V ..... 295
Cooke, Z. A. Pile Driver Castings..... 298
Corse, W. M. The Metallurgy of the Bronze Age ..... 218
Cowles, Alfred H. The Effect of Manganese in Manganese Bronze ..... 177
Custer, Edgar Alan. Casting Pipe in Permanent Molds ..... 138

De Clercy, Jules. Chemical Reactions in Foundry Cupola Practice ..... 296
Diller, H. E. Specifications for Cast Iron To Be Machined ..... 223
Estep, H. Cole. Ornamental Gray Iron Castings, Flour City Ornamental Iron Works ..... 63
Everitt, F. C. Foundry Warehouse Methods ..... 221
Fuller, B. D. Core Ovens for Light and Heavy Work ..... 58
Hailstone, George. Micro-Structure of Foundry Irons ..... 289

Hatch, W. T. Problems Involved in the Erection and Equipment of a Modern Foundry ..... 193
Hemist, A. C. Measuring the Capacity of Ladles ..... 11
Horne, Emil B. Casting Aluminum in Iron Molds ..... 68
Horner, Joseph. Molding a Steam Crane Cylinder ..... 168

Johnson, Dudley A. Prolonging the Life of Crucibles ..... 245

Kangaroo. Australian Notes ..... 183
Keep, W. J. Aluminum in Cast Iron.... 278
Keep, W. J. Cast Iron Notes....23-34-89-185
Keep, W. J. Cupola Slag ..... 303
Keep, W. J. Mixture for Heavy Cylinders ..... 303
Kelly, Geo. W. Bronze Casting Made of Hard and Soft Metal..... 93
Kirk, Dr. Edward. Sandwiched Hard Spots ..... 188
Kirk, Dr. Edward. The Cupola in Brass Founding ..... 10
K. K. Nickel Difficulties ..... 303

Loudon, Archie M. Core Making..... 248
Luhrsen, Louis. Phosphor-Bronze Rings. 179

McCarter, W. W. Method of Molding a Dome Casting ..... 128
McCaslin, H. J. Molding a Cast Steel Clam-Shell ..... 55
McDowell, R. H. Difficulties Experienced in Mixing Different Grades of Iron.... 5
Moldenke, Dr. Richard. Coal Consumption of Air Furnaces ..... 191
Moldenke, Dr. Richard. Cracking of Malleable Castings ..... 135
Moldenke, Dr. Richard. Ferro-Silicon for Malleable Heats ..... 35
Moldenke, Dr. Richard. Making Malleable Castings Without Annealing ..... 22
Moldenke, Dr. Richard. Malleable Castings Annealed in Scale and Charcoal.. 192
Moldenke, Dr. Richard. Malleable Mixtures ..... 45
Moldenke, Dr. Richard. Memorandum on Test Bars ..... 169
Moldenke, Dr. Richard. Over-Annealed Malleable Castings ..... 95
Moldenke, Dr. Richard. Production of Malleable Castings—II ..... 24
Moldenke, Dr. Richard. Production of Malleable Castings—III ..... 60
Moldenke, Dr. Richard. Production of Malleable Castings—IV ..... 117
Moldenke, Dr. Richard. Production of Malleable Castings—V ..... 173
Moldenke, Dr. Richard. Production of Malleable Castings—VI ..... 273
Moldenke, Dr. Richard. Tests of Vanadium in Cast Iron ..... 17
Moldenke, Dr. Richard. Tinned Malleable Castings ..... 186
Moldenke, Dr. Richard. Use of Titanium in Cast Iron ..... 240
Mumford, E. H. Foundry Convention Idea, The ..... 200

Nall, Jabez. Cylindrical Section Sweeping Device ..... 20
Nall, Jabez. Molding a Narrow Foundation Plate ..... 131

Ochler, E. H. The Annealing of Steel Castings ..... 92
Outerbridge, Alex E., Jr. Chilled Castings 35
Outerbridge, Alex. E., Jr. Chilled Rolls.. 187
Outerbridge, Alex. E., Jr. Hard Castings for Dies ..... 87
Outerbridge, Alex. E., Jr. Pin Holes in Chilled Castings ..... 29

Perrault, L. N. Production of Automobile Cylinders ..... 261
Perrigo, Oscar E. Classification of Patterns ..... 163
Perrigo, Oscar E. Practical Pattern Shop System ..... 77
Pfaindler, H. J. Molding a Difficult Casting ..... 4
Proctor, Charles H. Electro-Chemical Cleaning Baths and Their Application to Commercial Uses ..... 217

Ramp, Paul R. Errors in the Design of Patterns ..... 160
Ramp, Paul R. Large Cores Without Arbors ..... 15
Ramp, Paul R. Molding a Large Engine Frame ..... 51
Ries, Heinrich. Relative Values of the Physical and Chemical Examinations of Molding Sands ..... 224

Saunders, W. M. Ferro-Alloys in the Foundry ..... 266
Sayers, H. Steam ..... 52
Scribe. Difficulties Resulting From Expansion of Heavy Core Arbor..... 29
Shaw, T. Use of Pitch..... 167
Shaw, T. Wrought Iron in the Mixture 45
Shed, N. W. Steel in Brake Shoe Scrap. 186
Smith, M. B. Semi-Steel Mixtures and Methods of Calculating the Charges.... 166
Snow, Walter B. A Study of Cupola Blast Pressures ..... 287
Spare, C. R. Manganese Bronze ..... 301
Stoughton, Bradley. Micro-Constituents of Cast Iron ..... 41

Taylor, Ellsworth M. A Uniform Foundry Cost System ..... 284
Thompson, Alexander M. Spacing and Mounting Patterns ..... 180
Tuttle, H. N. A Roll Cleaning Device.. 41

Van Billiard, H. A Simple Flask Recording System ..... 300
Vickers, C. Bassite, A Substitute for Tin in Brass Mixtures..... 178
Vickers, C. Brass Foundry Notes..... 129
Vickers, C. Melting Brass Borings..... 91
Vickers, C. Recovering Grinding Dust... 188
Vickers, C. Shrinkage of Yellow Brass Castings ..... 45
Vickers, C. Silicon-Copper in the Brass Foundry ..... 1

Waterhouse, G. B. The Application of Science to Foundry Work ..... 130
Webster, F. A Scrap Pile Argument.... 90
Webster, F. Rat-Tailing and Other Difficulties Experienced by the Sunnysides Foundry & Machine Co..... 30
Webster, F. The Circular Saw as a Core Box Machine ..... 294

Yorker, N. E. A Discussion of the Core Print Question With the Patternmaker. 133

Zeller, Frank R. A Novel Method of Handling Metal in Brass Foundries.... 137

# *Data Sheets*

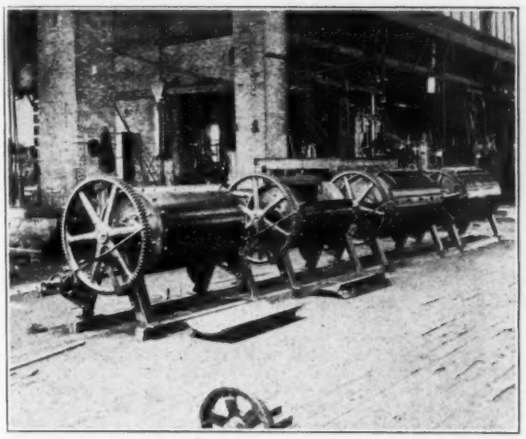
## *March 1908—August 1908*

Nos. 13, 14 and 15, March and April, 1908.—Standard Specifications for Cast Iron Car Wheels.

No. 16, April, 1908.—Standard Specifications for Locomotive Cylinders.

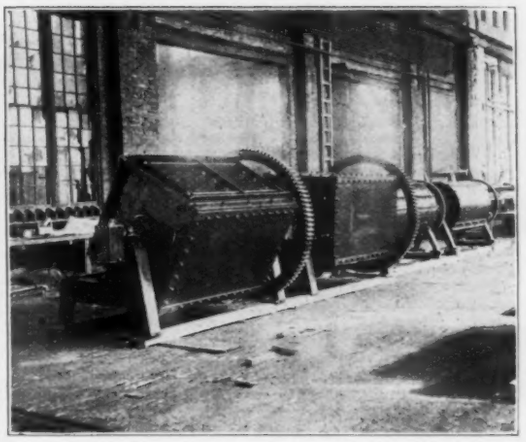
Nos. 17 and 18, May, 1908.—Measuring the Capacity of Ladles, and An Easy Method of Ascertaining the Amount of Iron in Ladles With a Gage Bar.

Nos. 19, 20, 21, 22, 23, 24, June, July and August, 1908.—Standard Specifications for Cast Iron Pipe and Special Castings.



Battery of Round Tumblers for Foundry of General Electric Co., Pittsfield, Mass.

Design Practical, Construction Rigid and Heavy, Insuring Durability.

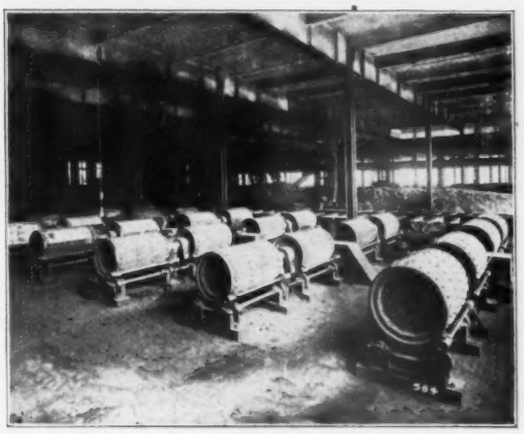


Battery of Square Tumblers for Foundry of General Electric Co., Pittsfield, Mass.

# WHITING TUMBLERS

A COMPLETE LINE OF TUMBLERS FOR ALL CLASSES OF WORK.

SPUR GEARED AND ROLLER DRIVE OUR SPECIALTY.



Part of installation of new type Roller Drive Tumblers in Malleable Plant, McCormick Division, International Harvester Company, Chicago

CAST IRON STAVES OR PLATE BARRELS.

ALL WEARING PARTS INTERCHANGEABLE.

34 SIZES OF STANDARD TUMBLERS.

*Can we send you our*

*Tumbler Catalog No. 54?*

SPECIAL DESIGNS FOR EXCEPTIONALLY HEAVY WORK, DRAW BARS, CAR COUPLERS, HEAVY STEEL CASTINGS, ETC.

"WHITING" FOUNDRY EQUIPMENT MEANS EXPERIENCE, EFFICIENCY, ECONOMY.

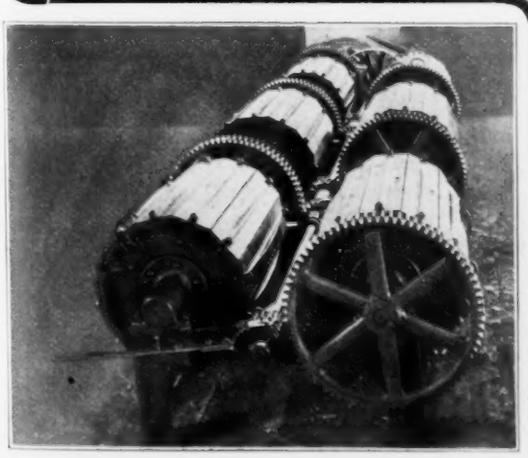
## WHITING FOUNDRY EQUIPMENT CO.

**MANUFACTURERS ENGINEERS DESIGNERS**

**HARVEY, ILL. (Chicago Suburb.)**

Battery of Six Spur Geared Tumblers

Battery of Eight Tumblers, installed in Manufacturers' Foundry Co., Milwaukee, Wis.



**New Line of Standard Square Tumblers**

| | | |
|---|---|---|
| No. | 108 | 24x42 in. |
| " | 110 | 24x48 " |
| " | 112 | 30x42 " |
| " | 114 | 30x48 " |
| " | 116 | 36x48 " |
| " | 118 | 36x60 " |
| " | 120 | 42x60 " |
| " | 122 | 42x72 " |

See our advertisement Cranes and Complete Foundry Equipment on page 42

# ADVERTISERS


Adams Co. ....18, 126
Addy, Matthew, & Co. 135
Ajax Metal Co. 132
Aktiebolaget Malcus Holmquist. 123
Albany & No. River Molding Sand Co. 128
Allen, James 103
American Air Compressor Works. 113
American Blower Co. 114
American Manganese Bronze Co. 132
Arcade Mfg. Co. 15
Atlas Car & Mfg. Co. 110

Baird & West 135
Ballou's White Sand Co. 128
Barnett, Oscar, Foundry Co. 127
Bassite Mining & Smelting Co. 28
Berkshire Mfg. Co. 19
Birkenstein & Sons, S. 136
Blackwell, Geo. G., Sons & Co. 131
*Blake, Geo. F., Mfg. Co. —
Box & Co., Alfred 109
Brass Founders' Supply Co. 125
Brighton Alloys Mfg. Co. 132
Bristol Co. 121
Brooklyn Facing Mills 129
Brown Hoisting Machinery Co. 104
Brown Specialty Machinery Co. 24
Buch's Sons Co., A. 17
Buffalo Forge Co. 101
Burdick & Son 125
Byram & Co. 126

Calumet Engineering Works. 40
Carborundum Co. 111
Carr & Speer 133
Case Mfg. Co. 105
Central Foundry Supply Co. 129
Chase Foundry & Mfg. Co. 110
Chisholm & Moore Mfg. Co. 139
Clark Cast Steel Cement Co. 119
Cleveland Crane & Car Co. 103
Cleveland Galvanizing Works Co. 103
Cleveland Steel Cement Co. 119
Coates Clipper Mfg. Co. 110
Combined Foundry Supply Co. 125
Connersville Blower Co. 32
Curtis & Co. Mfg. Co. 107

Darby & Sons, Edw. 103
*Deane Steam Pump Co. 127
Debevoise-Anderson Co. 135
De Clercy, Jules ....101, Insert
Detroit Foundry Supply Co. 97
Diamond Clamp & Flask Co. 122
Dimmick, J. K., & Co. 135
Dings Electro Magnetic Separator Co. 120
Dixon, Joseph, Crucible Co. 39
Dobson, William 116
Dodge & Day 134
Doggett, Stanley 122
Dominion Foundry Supply Co. ....Insert
Drucklieb, C. 116

Electric Smelting & Aluminum Co. 8
Elm City Engineering Co. 120
Engineers' & Founders' Laboratories. 133
Etting, Edward J. 128

Falls Rivet & Machine Co. 6
Field, Alfred, & Co. 121
Fisher, Alfred 114
Fox Machine Co. 119

Gautier, J. H., & Co. ....118, 121
Goldschmidt Thermit Co. 115
Goodrich, F. A., & Co. 135
G. & W. Mfg. Co. 104
Gregg Mfg. Co. 35
Gulick-Henderson & Co. 133

Haedrich, E. M. 103
Hamilton Facing Mill Co. ....Insert
Hamilton Iron & Steel Co. 136
Hanna Engineering Works. 126
*Harbison-Walker Refractories Co. 129
Harrison, Joseph 118
Hauck Mfg. Co. 112
Herman Pneumatic Machine Co. 16
Hickman, Williams & Co. ....Cover
Hillman, J. H., & Son. 137
Holland Linseed Oil Co. 120

Industrial Law League, Inc. 120

Jones & Attwood 121

Keep, W. J. 134
Kerr Turbine Co. 113
*Kessler & Weidemann. 134
Kilbourne & Jacobs Mfg. Co. 103
Killing Molding Machine Works. 14
Knickerbocker Co. 117
Kroeschell Bros. Co. 115

Laclede-Christy Clay Products Co. 129
Lang, R. F. 133
Leavitt & Co., C. W. 133
Lindsay, W. W., & Co. 128

Macphail Flask & Machine Co. 22
Maris Bros. 105
Maurer, Henry, & Son. 129
McCormick, J. S., Co. 119
McCullough-Dalzell Crucible Co. 38
McKeefrey & Co. 137
Metallic Alloys Co. 130
Merrick Foundry Supply Co. ....Insert
Metallurgical Laboratory 133
Midvale Mining & Mfg. Co. 132
Millers' Products Co. 123
Millet Core Oven Co. 121
Mills Mfg. Co., E. H. —
Milwaukee Correspondence School of Fdy. Chemical Analysis 134
Mohr, J. J., & Sons. 136
Monarch Engineering & Mfg. Co. 34
Morgan Engineering Co. 101
Moyer Tramrail Co. 108
Mumford, E. H., & Co. 21

Nash, Isham & Co. 135
New England Eng. & Equipment Co. 109
New Era Mfg. Co. 131
Newport Sand Bank Co. 128
Northern Enginering Works. ....Back cover
Norwalk Iron Works Co. 113

Obermayer, S., Co. ....2, 3
Osborn Mfg. Co. 117
Otis Steel Co. 112

Pangborn Co., Thomas W. 5
Pawling & Harnischfeger. 104
Paxson, J. W., Co. ....Insert
Peninsular Tool & Specialty Co. 116
*Penn, Wm., Silica Works. 129
Pettinos Bros. 99
Phosphor Bronze Smelting Co. 132
Pickands, Mather & Co. 137
Pilling & Crane. 137
Piqua Blower Co. 41
Pridmore, Henry E. ....10, 11
Primos Chemical Co. 130

Quincy, Manchester, Sargent Co. 106

Randall Tramrail Co. 107
Rathbone, John A. 20
Reid Foundry & Mach. Co. ....Insert
Ridgway & Son Co. 30
Robeson Process Co. 25
Rockwell Furnace Co. 130
Roessler & Hasslacher Chemical Co. ...131, 133
Rogers, Brown & Co. ....135, 138
Roots, P. H. & F. M., Co. ....Insert
Ross-Tacony Crucible Co. 36

Samuel, Frank 135
Seaver, John W. 134
Sellers, Wm., & Co. 124
Shanafelt Mfg. Co. 29
Shelton Metallic Filler Co. 26
Shepard, Chas. G. 135
Shepard Electric Crane & Hoist Co. 105
Shuster, F. B., Co. 112
Sly, W. W., Mfg. Co. 7
Smith, J. D., Foundry Supply Co. 9
Smith & Caffrey Co. 126
Smith, Rudy & Co. 133
Smooth-On Mfg. Co. 23
Swoboda, L. J. 124
Standard Sand & Machine Co. 124
Stevens, F. B. ....27, 95
Stow Mfg. Co. 116
Stradley & Co., Edward M. 103
Sturtevant, B. F., Co. 31
Superior Charcoal Iron Co. 135

Tabor Mfg. Co. ....12, 13
Taylor, A. L. 121
Taylor, Robt., Jr., Inc. 37
Thomas Furnace Co. 135
Thompson, Lewis 116
Tilghman-Brooksbank Sand Blast Co. 117
Touche, Niven & Co. 94
Turner Machine Co. 112

U. S. Chaplet Supply Co. 125
United Iron & Steel Co. 137

Vivian Bond & Co. 130

Walter-Wallingford & Co. ....136, 137
Webb Mfg. Co. 113
Western Foundry Supply Co. 130
Whitehead Bros. Co. 4
Whiting Foundry Equipment Co. ....42, 93
Wilbraham-Green Blower Co. 33

Yale & Towne Mfg. Co. 111



**TOUCHE, NIVEN & CO.,** *Public Accountants*

30 Broad Street, NEW YORK CITY

**PRODUCTION COSTS DEPARTMENT**

Our Foundry Work is under the personal supervision of

MR. ELLSWORTH M. TAYLOR.

Consultation in this and all other branches of Accounting may be arranged for by correspondence.

ALSO REPRESENTED IN LONDON, ENGLAND, AND IN CHICAGO, ILL.

Offices, Warehouse and Platers' Supplies Factory,
Corner Larned and Third Streets.


# Frederic B. Stevens

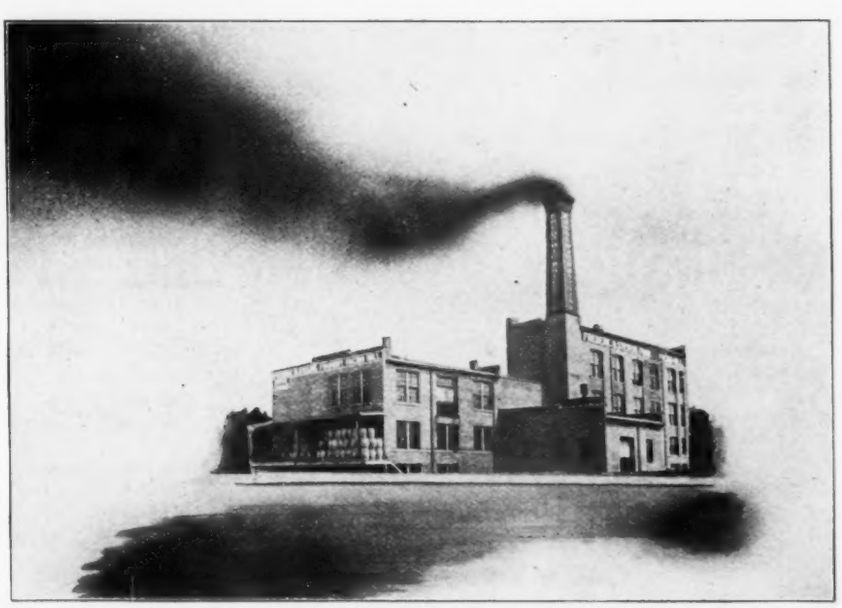
Manufacturer

**FOUNDRY FACINGS AND SUPPLIES**
**Buffing Compositions and Platers' Supplies**

**DETROIT, MICH.**

Export warehouse, Windsor, Ont.

I am doubling each opportunity for decreasing the expense. That's one reason why I can sell you Foundry Supplies and Facings, Polishers' and Platers' Compositions and Supplies more cheaply than the other people. I mean "cheaply" at the end; I give you honest goods which fill an actual need in your factory.

Facing Mills, Isabella Avenue and Michigan Central R. R.

See page 27

# BUYERS DIRECTORY

*Advertisements can be found readily by reference to the Alphabetical Index*

**Abrasives.**
Carborundum Company, Niagara Falls.

**Accountants:**
Stradley & Co., Edward M., Philadelphia.
Touche, Niven & Co., New York, N. Y.

**Air Compressors:**
American Air Compressor Works, New York.
Curtis & Co. Mfg. Co., St. Louis.
Norwalk Iron Works Co., So. Norwalk, Conn.

**Alloys:**
Blackwell, Geo., Sons & Co., Ltd., Liverpool, Eng.
Electric Smelting & Aluminum Co., Lockport, N. Y.
Leavitt & Co., C. W., New York.
New Era Mfg. Co., Kalamazoo, Mich.
Phosphor Bronze Smelting Co., Ltd., Philadelphia.
Primos Chemical Co., Primos, Pa.

**Analysis—Mechanical:**
Keep, W. J., Detroit.

**Analysis—Chemical:**
Engineers & Founders Laboratories, Pittsburg.
Haedrich, E. M., Philadelphia.
Kessler & Wiedemann, St. Louis, Mo.
Metallurgical Laboratory, Pittsburg.
Smith, Rudy & Co., Philadelphia.

**Babbitt Metal:**
Ajax Metal Co., Birmingham, Ala.
Phosphor-Bronze Smelting Co., Ltd., Philadelphia, Pa.

**Barrels (Shop and Foundry).**
Kilbourne & Jacobs Mfg. Co., Columbus, O.

**Bellows:**
Osborn Mfg. Co., Cleveland.
Shanafelt Mfg. Co., Canton, O.

**Blowers:**
American Blower Co., Detroit.
Buffalo Forge Co., Buffalo, N. Y.
Connersville Blower Co., Connersville, Ind.
Monarch Engineering & Mfg. Co., Baltimore.
Paxson, J. W. Co., Philadelphia.
Piqua Blower Co., Piqua, Ohio.
Roots, P. H. & F. M. Company, Connersville, Ind.
Sturtevant, B. F., Co., HydePark,Mass.

**Blowers—Positive Pressure:**
Connersville Blower Co., Connersville, Ind.
Piqua Blower Co., Piqua, Ohio.
Roots, P. H. & F. M. Company, Connersville, Ind.
Sturtevant, B. F., Co., HydePark,Mass.
Wilbraham-Green Blower Co., Philadelphia.

**Books:**
Allen, James, Los Angeles, Cal.

**Boxes (Tote and Shop).**
Kilbourne & Jacobs Mfg. Co., Columbus, O.

**Brazing Outfits.**
Hauck Mfg. Co., Brooklyn, N. Y.

**Bronze (Manganese).**
American Manganese Bronze Co., 99 John St., New York City.
Electric Smelting & Aluminum Co., Lockport, N. Y.

**Brushes:**
American Wire Brush Co., New York.
Osborn Mfg. Co., Cleveland.
Shanafelt Mfg. Co., Canton, O.

**Burners (Oil):**
Hauck Mfg. Co., Brooklyn, N. Y.
Monarch Engineering & Mfg. Co., Baltimore.
Rockwell Engineering Co., New York.

**Carbanese.**
Midvale Mining & Mfg. Co., E. St. Louis, Ill.

**Castings (Phosphor-Bronze).**
Phosphor-Bronze Smelting Co., Ltd., Philadelphia, Pa.

**Castings (Manganese Bronze):**
American Manganese Bronze Co., New York City.

**Castings (Steel):**
Otis Steel Co., Ltd., Cleveland.

**Cement (Furnace):**
Gautier, J. H. & Co., Jersey City.

**Cement (Metallic):**
Clark Cast Steel Cement Co., Shelton, Conn.
Cleveland Steel Cement Co., Cleveland.
Shanafelt Mfg. Co., Canton, O.
Shelton Metallic Filler Co., Derby, Conn.
Smooth-On Mfg. Co., Jersey City.

**Chaplets:**
Burdick & Son, Albany, N. Y.
Lindsay, W. W. & Co., Philadelphia.
Shanafelt Mfg. Co., Canton, O.
United States Chaplet & Supply Co., New York.

**Coke:**
Baird & West, Detroit, Mich.
Dimmick, J. K., & Co., Philadelphia.
Debevoise-Anderson Co., New York.
Hanna & Co., M. A., Cleveland, O.
Hillman, J. H. & Son, Pittsburg.
Rogers, Brown & Co., Cincinnati.
Samuel, Frank, Philadelphia.

**Cores:**
Brown Specialty Machry. Co., Chicago.

**Core Binders:**
Robeson Process Co., Au Sable Forks, N. Y.

**Core Compound.**
Actiebolaget Malcus Holmquist, Halmstad, Sweden.
Albany & No. River Molding Sand Co., Albany, N. Y.
Holland Linseed Oil Co., Chicago, Ill.
Miller's Product Co., Chicago, Ill.
Mills Mfg. Co., The H. E., Syracuse, N. Y.

**Core Machines:**
Brown Specialty Machry. Co., Chicago.
Falls Rivet & Mch. Co., Cuyahoga Falls, O.
Jones & Atwood, Stourbridge, Eng.

**Core Ovens:**
Atlas Car & Mfg. Co., Cleveland.
Falls Rivet & Mch. Co., Cuyahoga Falls, O.
Hyde & Co., Francis, Montreal, Que.
Millett Core Oven Co., Brightwood, Mass.
Northern Engineering Works, Detroit.
Pangborn Company, Thomas W. New York.
Paxson, J. W. Co., Philadelphia.
Roberts Portable Oven Co, Chicago.
Smith, J D., Foundry Supply Co., Cleveland.

**Core Oven Recording Thermometer:**
Bristol Co., Waterbury.

**Core Tapering Machines:**
Brown Specialty Machry. Co., Chicago.

**Cost Keeping Systems:**
Stradley & Co., Edward M., Philadelphia, Pa.
Touche, Niven & Co., New York City.

**Cranes:**
Box & Co., Alfred, Philadelphia, Pa.
Brown Hoisting Machine Co., The, Cleveland.
Case Mfg. Co., Columbus, O.
Cleveland Crane & Car Co., Wickliffe, O.
Curtis & Co. Mfg. Co., St. Louis, Ill.
G. & W. Mfg. Co., New York, N. Y.
General Pneumatic Tool Co., Montour Falls, N. Y.
Maris Bros., Philadelphia.
Morgan Engineering Co., Alliance, O.
Northern Engrng. Works, Detroit.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Quincy, Manchester, Sargent Co., Plainfield, N. J.
Ridgway, Craig & Son, Coatesville, Pa.
Sellers, William & Co., Inc., Philadelphia.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry & Equipment Co., Harvey, Ill.

**Crucibles:**
Brass Founders Supply Co., Newark, N. J.
Dixon Crucible Co., Jos., Jersey City.
Gautier, J. H. & Co., Jersey City.
McCullough-Dalzell Crucible Co., Pittsburg.
Monarch Engineering & Mfg. Co., Baltimore.
Paxson, J. W. Co., Philadelphia.
Ross-Tacony Crucible Co., Philadelphia.
Taylor, A. L., San Francisco.
Taylor, Robt. J., Inc., Philadelphia.

**Cupolas:**
Byram & Co., Detroit.
Calumet Engrg. Wks., Harvey, Ill.
DeClercy, Jules, Montreal, Que.
Detroit Foundry Supply Co., Detroit.
Etting, Edward J., Philadelphia.
McCormick, J. S. Co., Pittsburg.
Northern Engineering Works, Detroit, Mich.
Paxson, J. W. Co., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.

# Salesmen's Instructions

Every new account placed on our books costs $10.00 to secure.

Do not jeopardize any of these accounts in trying to make an extra two or three dollars, ordering shipped an inferior article to that which you have sold.

If the margin will warrant it, give the customer something better; he will gratefully remember it and be glad to have you call again.

Buyers are not looking for cheap articles, but if they do buy a low priced commodity it is because you or ourselves have assured them the value is there. We cannot afford to disappoint them. The average buyer is a seller, and he knows he cannot give his trade $1.00 for 90c—no more can you.

If they are in the market for **PLUMBAGO**—show them the advantage in using our **No. 48.** Remember this is as it comes from the mine at Colombo, East India, excepting that it is ground, not crude. Detroit Testing Laboratory analysis shows fixed carbon 61.14, fineness 197, through 200 mesh screen 96.18%, while competitive analysis shows—22.93, 42.67, 55.81, 58.03, 58.35 carbon. The reason for our higher per centage of carbon, is due to our air floating machinery, silica in crude material being heavier than Plumbago will not air float. Others grinding with burr-stone mills grind everything which goes therein.

Sum up your **PLUMBAGO** story by showing the buyer that by using our **No. 48,** he will have a high grade material for his good work; can add 50% soapstone and have the equivalent of the average 3½c or 4c goods, to be used on work with which he is not so particular.

Tell him about **EUREKA BLACKING** peeling clean.

That there is no necessity of using Molasses or Clay Wash; that water only is necessary to mix it in.

That it positively will not rub off the core.

That there is no graphitic carbon in its make up which produces a hard scale and incurs the displeasure of the machinist and the injury of his tools.

That the price is lower than any graphite or plumbago core wash on the market.

That he can order it, with the distinct understanding that it prove satisfactory, or no pay.

## The Detroit Foundry Supply Co.

FACING
FIRE BRICK
FOUNDRY SUPPLIES
FOUNDRY EQUIPMENT

**Detroit, Michigan** **Windsor, Ontario**

WE ARE DISTRIBUTING AGENTS FOR GLUTRIN.

**Dowel Pins:**
Shanafelt Mfg. Co., Canton, O.

**Electric Generating Sets:**
Sturtevant, B. F. Co., Hyde Park, Mass.

**Elevators:**
Curtis & Co. Mfg. Co., St. Louis.
Northern Engineering Works, Detroit.

**Engines (Steam):**
American Blower Co., Detroit.

**Engineers (Foundry, Mech., Elec., Etc.):**
Carr & Speer, New York City.
Dodge & Day, Philadelphia.
Lindsay, W. W. & Co., Philadelphia.
Northern Eng. Wks., Detroit, Mich.
Seaver, John W., Cleveland.
Smith Foundry Supply Co., J. D. Cleveland, O.

**Exhausters (Gas):**
Wilbraham-Green Blower Co., Philadelphia.

**Facings:**
Combined Foundry Supply Co., Buffalo, N. Y.
Detroit Foundry Supply Co., Detroit.
Dixon Crucible Co., Jos., Jersey City.
Doggett, Stanley, New York.
Hamilton Facing Mills Co., Ltd., Hamilton, Ont.
McCormick, J. S. Co., Pittsburg.
Obermayer, S. Co., Cincinnati.
Paxson, J. W. Co., Philadelphia.
Pettinos Bros., Bethlehem, Pa.
Stevens, F. B., Detroit.

**Fans:**
American Blower Co., Detroit.

**Ferro-Alloys.**
Brighton Alloy Mfg. Co., Sta. B., Cincinnati, O.

**Ferro-Manganese:**
Lang, R. F., New York City.
Metallic Alloys Co., New York City.
Midvale Mining & Mfg. Co., St. Louis, Mo.
Rogers, Brown & Co., Cincinnati.
Vivian Bond & Co., New York City.
Western Foundry Supply Co., E. St. Louis, Ill., New York City.

**Ferro-Silicon:**
Lang, R. F., New York City.
Midvale Mining & Mfg. Co., St. Louis, Mo.
Primos Chemical Co., Primos, Pa.
Roessler & Hasslacher Chemical Co., New York.
Vivian Bond & Co., New York City.
Western Foundry Supply Co., E. St. Louis, Ill., New York City.

**Fillers (Metallic):**
Clark Cast Steel Cement Co., Shelton, Conn.
Cleveland Steel Cement Co., Cleveland.
Shanafelt Mfg. Co., Canton, O.
Shelton Metallic Filler Co., Derby, Conn.
Smooth-On Mfg. Co., Jersey City.

**Fillets (Leather & Wood):**
Shanafelt Mfg. Co., Canton, O.

**Fire Brick:**
Detroit Foundry Supply Co., Detroit.
Federal Clay Products Co., Mineral City, O.
Gautier, J. H. & Co., Jersey City.
Harbison & Walker, Pittsburg.
Maurer, Henry, & Son, New York.
Laclede-Christy Clay Products Co., St. Louis.
Paxson, J. W. Co., Philadelphia.
Wm. Penn., Silica Works. Wm. Penn, P. O., Philadelphia.

**Fire Sand:**
Carborundum Co., Niagara Falls, N. Y.

**Flasks:**
Adams Co., Dubuque, Ia.
Barnett, Oscar, Fdy. Co., Newark.
Brass Founders' Supply Co., Newark.
Killing Molding Machine Co., Davenport, Ia.
McPhail Flask & Mch. Co., Chicago, Ill.

**Flasks (Snap):**
Adams Co., Dubuque, Ia.
Brass Founders Supply Co., Newark, N. J.
Diamond Clamp & Flask Co., Richmond, Ind.
Killing Molding Machine Co., Davenport, Ia.
McPhail Flask & Mch. Co., Chicago, Ill.
Obermayer, S. Co., Cincinnati.
Paxson, J. W. Co., Philadelphia.
Smith & Caffrey Co., Syracuse, N. Y.

**Flux (Brass):**
Foundry Specialty Co., Cincinnati.

**Foundry Correspondence School.**
Milwaukee Corres. School of Fdy., Milwaukee, Wis.

**Foundry Equipment (Iron & Brass):**
Barnett, Oscar, Foundry Co., Newark.
Brass Founders Supply Co., Newark, N. J.
Etting, Edward J., Philadelphia.
New England Eng. & Equip. Co., Boston, Mass.
Northern Engrng. Works, Detroit.
Obermayer, S. Co., Cincinnati.
Pangborn Company, Thomas W. New York.
Sly, W. W. Mfg. Co., Cleveland.
Standard Sand & Machine Co., Cleveland.
Stevens, F. B., Detroit.
Taylor, Robert J., Inc., Philadelphia.

**Forges (Oil):**
Hauck Mfg. Co., Brooklyn, N. Y.

**Foundry Supplies:**
Central Foundry Supply, Columbus, O.
Cleveland Tumbling Barrel & Mfg. Co., Cleveland, O.
Combined Foundry Supply Co., Buffalo, N. Y.
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Ltd., Montreal, Que.
Hamilton Facing Mills Co., Ltd., Hamilton, Ont.
Hyde & Co., Francis, Montreal, Que.
McCormick, J. S. Co., Pittsburg.
Merrick Fdy. Supply Co., Toronto, Can.
Mills Mfg. Co., The H. E., Syracuse, N. Y.
Obermayer, S. Co., Cincinnati.
Osborn Mfg. Co., Cleveland.
Pangborn Company, Thomas W. New York.
Paxson, J. W. Co., Philadelphia.
Shanafelt Mfg. Co., Canton, O.
Smith, J. D., Foundry Supply Co., Cleveland.
Stevens, F. B., Detroit.
Taylor, A. L., San Francisco.
Taylor, Robert J., Inc., Philadelphia.
Whitehead Bros. Co., New York, Providence, Buffalo.

**Furnaces (Melting):**
Barnett, Oscar, Foundry Co., Newark, N. J.
Brass Founders Supply Co., Newark, N. J.
Fisher, Alfred, Chicago, Ill.
Hauck Mfg. Co., Brooklyn, N. Y.
Monarch Engineering & Mfg. Co., Baltimore.
Northern Eng. Wrks., Detroit, Mich.
Paxson, J. W. Co., Philadelphia.
Rockwell Furnace Co., New York.

**Furnaces (Oil).**
Hyde & Co., Francis, Montreal, Que.

**Gates (Skim):**
Harrison, Joseph, Milwaukee, Wis.

**Graphite:**
Dixon Crucible Co., Jos., Jersey City.

**Greases:**
United Specialty Mfg. Co., Cleveland.

**Grinding Machinery:**
Adams Co., Dubuque, Ia.

**Heating & Ventilating Apparatus:**
American Blower Co., Detroit.
Sturtevant, B. F., Co., HydePark, Mass.

**Hoists:**
Box & Co., Alfred, Philadelphia, Pa.
General Pneumatic Tool Co., Montour Falls, N. Y.
Northern Eng. Wks., Detroit, Mich.
Pawling & Harnischfeger, Milwaukee.
Ridgway & Son Co., Coatesville, Pa.
Sellers, William, & Co., Inc., Philadelphia.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York.

**Hoists (Chain).**
Chisholm & Moore Mfg. Co., Cleveland, O.

**Hoists (Electric):**
Quincy, Manchester, Sargent Co., Plainfield, N. J.
Northern Engrng. Works, Detroit.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Yale & Towne Mfg. Co., New York.

**Hoists (Hand):**
Chisholm & Moore Mfg. Co., Cleveland, O.
Northern Engrng. Works, Detroit.

**Hoists (Pneumatic):**
Curtis & Co. Mfg. Co., St. Louis.
Northern Eng. Wks., Detroit, Mich.

**Industrial Ry. Equipment.**
Atlas Car & Mfg. Co., Cleveland.
Chase Foundry & Mfg. Co., The, Columbus, O.
Northern Eng. Wks., Detroit, Mich.

**Iron Ore:**
Rogers, Brown & Co., Cincinnati.

**Ladle Dryers.**
Hauck Mfg. Co., Brooklyn, N. Y.

**Lockers (Metal).**
Darby & Sons, Edw., Philadelphia.

**Lumber:**
Thompson, Lewis, Philadelphia, Pa.

**Metals.**
Birkenstein & Sons, S., Chicago, Ill.
Leavitt & Co., C. W., New York.

**Mold Dryers.**
Hauck Mfg. Co., Brooklyn, N. Y.

**Molding Machines:**
Adams Co., Dubuque, Ia.
Arcade Manufacturing Co., Freeport, Ill.
Berkshire Mfg. Co., Cleveland.
Buch's, A., Sons Co., Elizabethtown, Pa.
Herman Pneumatic Machine Co., Zelienople, Pa.
Hyde & Co., Francis, Montreal, Que.
Killing Molding Machine Co., Davenport, Ia.
Mumford, E. H. Co., Philadelphia.
Paxson, J. W. Co., Philadelphia.
Pridmore, Henry E., Chicago.
Rathbone, John A., Detroit.
Reid Foundry & Machine Co., Ltd., Ingersoll, Can.
Smith, J. D., Foundry Supply Co., Cleveland.
Tabor Mfg. Co., Philadelphia.
Webb Mfg. Co., J. F., Davenport, Ia.

330 330 330

# No. 330 Plumbago

Produced by us from the choicest Ceylon Product is what the makers of BEST CASTINGS in the U. S. are using.

## Plumbago Compound, Colombo Ceylon

The man who makes machinery castings, who wants a smooth clean face, blue black color and all that sort of thing, will not get perfect results without No. 330.

No. 330 is not the cheapest, but it is positively the best Plumbago Facing produced. If you are having trouble with your facing, write us.

## PETTINOS BROTHERS

NEW YORK BETHLEHEM, PA. PHILADELPHIA
COLOMBO, CEYLON

330 330 330

**Oils (Core):**
Holland Linseed Oil Co., Chicago, Ill.

**Packing (Rubber Sheet):**
Smooth-On Mfg. Co., Jersey City.

**Parting Compounds:**
Brooklyn Facing Mills, Brooklyn, N. Y.
Doggett, Stanley, New York.
Swoboda, L. J., New York.

**Patents.**
Industrial Law League, Inc.,
170 Broadway, New York.

**Pattern Letters:**
H. W. Knight & Son,
Seneca Falls, N. Y.
Shanafelt Mfg. Co., Canton, O.

**Pattern Makers' Supplies:**
Cleveland Fillet Co., Cleveland.
Shanafelt Mfg. Co., Canton, O.

**Patterns (Metal and Wood):**
Herman Pneumatic Machine Co.,
Zelienople, Pa.

**Pattern Shop Equipment:**
Fox Machine Co., Grand Rapids, Mich.

**Phosphorizers:**
McCullough-Dalzell Crucible Co.,
Pittsburg.
New Era Mfg. Co., Kalamazoo.

**Pig Iron:**
Addy, Mathew & Co., Cincinnati, O.
Domhoff & Joyce Co., Cincinnati.
Goodrich, F. A., & Co., Detroit.
Hamilton Iron & Steel Co.,
Hamilton, O.
Hanna & Co., M. A., Cleveland, O.
Hickman, Williams & Co.,
Chicago, Ill.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., Philadelphia.
Nash, Isham & Co., New York.
Pickands, Mather & Co., Cleveland.
Pilling & Crane, Philadelphia.
Rogers, Brown & Co., Cincinnati.
Samuel, Frank, Philadelphia, Pa.
Shepard, Chas. G., Buffalo.
Stevens, F. B., Detroit.
Superior Charcoal Iron Co.,
Grand Rapids, Mich.
Thomas Furnace Co., Milwaukee.
United Iron & Steel Co., Pittsburg.
Walter-Wallingford & Co.,
Cincinnati and Pittsburg.

**Plumbago:**
Dixon Crucible Co., Jos., Jersey City.
Gautier, J. H., & Co., Jersey City.
McCormick Co., J. S., Pittsburg.
McCullough-Dalzell Crucible Co.,
Pittsburg.
Obermayer, S. Co., Cincinnati.
Pettinos Bros., Bethlehem, Pa.
Ross-Tacony Crucible Co.,
Philadelphia.
Smith, J. D., Foundry Supply Co.,
Cleveland.
Stevens, F. B., Detroit.
Whitehead Bros. Co.,
New York, Providence, Buffalo.

**Polishers' and Planers' Supplies:**
Stevens, F. B., Detroit.

**Rapping Plates:**
Shanafelt Mfg. Co., Canton, O.

**Riddles:**
Adams Co., Dubuque, Ia.

**Sand:**
Albany & No. River Molding Sand Co.,
Albany, N. Y.
Ballou's White Sand Co.,
Millington, Ill.
Brass Founders Supply Co.,
Newark, N. J.
Newport Sand Bank Co., Newport, Ky.
Haedrich, E. M., Philadelphia, Pa.
Pangborn Company, Thomas W.
New York.
Standard Sand & Machine Co.,
Cleveland.
Stevens, F. B., Detroit.
Whitehead Bros. Co.,
New York, Providence, Buffalo.

**Sand Blast Machinery:**
Drucklieb, C., New York.
Pangborn Company, Thomas W.
New York.
Paxson, J. W. Co., Philadelphia.
Tilghman-Brooksbank Sand Blast
Co., Philadelphia.

**Sand Mixing Machinery:**
Falls Rivet & Machine Co.,
Cuyahoga Falls, O.
Mumford, E. H., Philadelphia.
Pangborn Company, Thomas W.
New York.
Sellers, William & Co., Inc.,
Philadelphia.
Standard Sand & Machine Co.,
Cleveland.

**Sand Sifters:**
Deane Steam Pump Co.,
Holyoke, Mass.
Hanna Engrg. Works, Chicago, Ill.
Herman Pneumatic Machine Co.,
Zelienople, Pa.
Killing Molding Machine Co.,
Davenport, Ia.
Standard Sand & Machine Co.,
Cleveland.
U. S. Chaplet Supply Co., New York.

**Saws (Cold Cutting):**
Quincy, Manchester, Sargent Co.,
Plainfield, N. J.
Tabor Mfg. Co., Philadelphia.

**Screens (Sand).**
Darby & Sons Co., Inc., Edward,
Philadelphia, Pa.

**Seacoal:**
Obermayer, S. Co., Cincinnati.
Whitehead Brothers Co.,
New York, Providence, Buffalo.

**Separators (Magnetic):**
Dings Electro Magnetic Sep. Co.,
Milwaukee.
Elm City Engineering Co., New Haven.
Pangborn Company, Thomas W.
New York.

**Shafting (Flexible):**
Stow Mfg. Co., Binghamton, N. Y.

**Shovels:**
Osborn Mfg. Co., Cleveland.
Stevens, F. B., Detroit.

**Sprue Cutters:**
Barnett, Oscar, Fdy. Co., Newark.
Brass Founders Supply Co.,
Newark, N. J.
Shuster, F. B., Co., New Haven.
Turner Machine Co., Philadelphia.

**Stoppers:**
McCullough-Dalzell Crucible Co.,
Pittsburg.
Ross-Tacony Crucible Co.,
Philadelphia.
Taylor, Robert J., Inc., Philadelphia.

**Testing Machines:**
Keep, W. J., Detroit.

**Thermit Process:**
Goldschmidt Thermit Co., New York.

**Tools (Molders'):**
Dobson, William, Canastota, N. Y.
Obermayer, S. Co., Cincinnati.
Paxson, J. W. Co., Philadelphia.
Peninsular Tool & Specialty Co.,
Detroit, Mich.

**Tramrail Systems:**
Moyer Tramrail Co., Harvey, Ill.
Northern Eng. Wks., Detroit, Mich.
Randall Tramrail Co., Philadelphia.

**Trolleys:**
G. & W. Mfg. Co., New York, N. Y.
Northern Eng. Wks., Detroit, Mich.
Pawling & Harnischfeger, Milwaukee.

**Trucks.**
Chase Fdy. & Mfg. Co., Columbus, O.
Northern Eng. Wks., Detroit, Mich.

**Tumbling Mills:**
Adams Co., Dubuque, Ia.
Cleveland Tumbling Barrel & Mfg. Co.,
Cleveland, O.
Falls Rivet & Mch. Co.,
Cuyahoga Falls, O.
Northern Eng. Wks., Detroit, Mich.
Sly, W. W., Mfg. Co., Cleveland.

**Turbines:**
Kerr Turbine Co., Wellsville, N. Y.

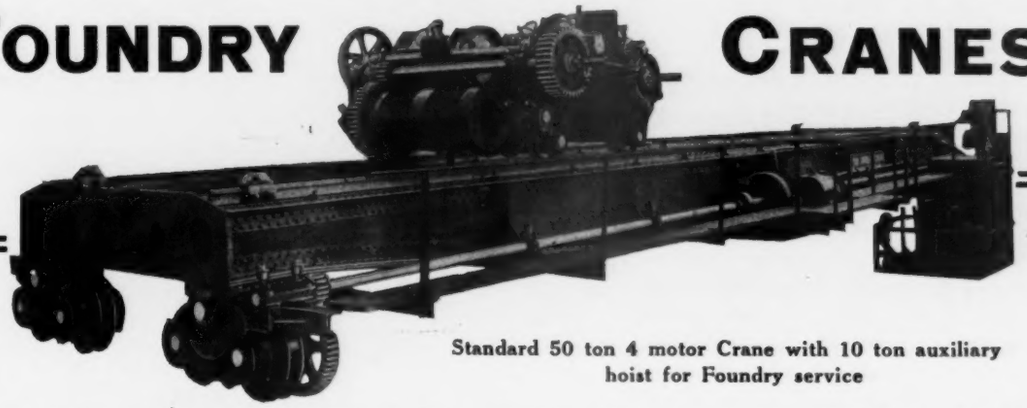
**Turntables.**
Northern Eng. Wks., Detroit, Mich.

**Wax Wire:**
Field, Alfred & Co., New York City.

**Wire Straighteners:**
Blake, Geo. F., Mfg. Co.,
New York City
Gregg Mfg. Co., Cleveland, O.
Shuster, F. B. Co., New Haven.

FORTY YEARS EXPERIENCE BUILDING

# FOUNDRY CRANES



3000 Cranes in use

Capacity 3 tons and up

Standard 50 ton 4 motor Crane with 10 ton auxiliary hoist for Foundry service

Largest Manufacturers of Electric Traveling Cranes in the World. Also manufacturers of Largest Cranes in the World. Capped Bearings throughout. All Shafts removable with gears in place. All gears made of Steel. Special attention given to lubrication and interchangeable parts.

## THE MORGAN ENGINEERING COMPANY

**Alliance, Ohio**

ESTABLISHED 1868

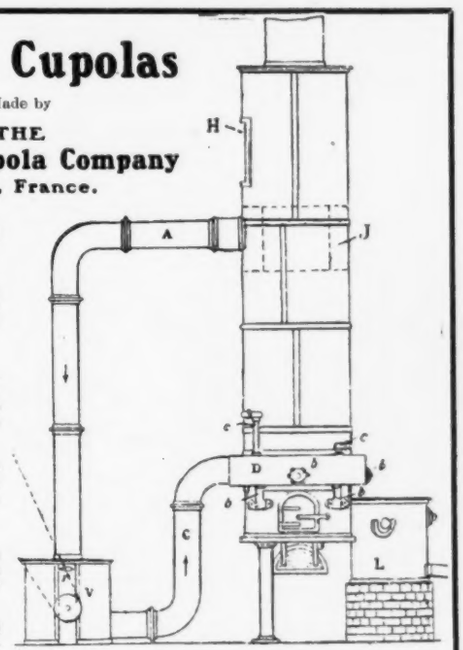
**Builders of Hammers, Shears and all kinds of heavy special machinery.**
**Pioneer Crane Builders. 3000 Cranes in successful operation.**

**CHICAGO, ILL.** Railway Exchange
**NEW YORK** 165 Broadway
**PITTSBURG, PA.** Frick Building
**BRUSSELS, BELGIUM** 52 Rue du Congres
**London, Paris, Copenhagen, Tokio.**



## Baillot Cupolas

Made by
**THE**
**Baillot Cupola Company**
**Paris, France.**




Baillot Cupolas, specially designed to suit each case.

Guaranteed saving in fuel of 12% to 30%, as compared to old system.

Old cupolas adapted to the system, or entirely new ones built on same terms.

We build or alter cupolas at our own expense, and guarantee results.

Buyer pays us with the price of the fuel we save for him.

Payment spread over period required to save the price of the plant.

...REFERENCES...

A. Suction pipe.
b. c. c'. Rows of tuyeres.
C. Blast pipe.
D. Wind belt.
J. Recuperating ring.
H. Charging door.
V. Blower.
L. Front crucible.

**Jules De Clercy, C. E.**

**Sole Agent for Canada and the United States**

**62 Ontario Street West**
**MONTREAL**



The Steady Trend of Foundry Cupola Practice has been toward getting the best results with the least power consumption.

Dust-Proof, Ring-Oiling Bearings

# Buffalo

Steel Pressure Blowers for

**Cupola Blast, Forge Fires, Heating Furnaces and ALL High Pressure Service**

have effectually put out of business all antedated, old-fashioned equipment.

*May our Engineering Department send you a description of Buffalo Blowers arranged for Cupola service?*

## Buffalo Forge Co.

**Buffalo, N. Y., U. S. A.**

**Canadian Buffalo Forge Co., Ltd.,**
*Cat. P.B.C.* **Montreal** *21B*

# CLASSIFIED ADVERTISEMENTS

**Wanted and For Sale advertisements 40 cents a line. Positions and Help Wanted 25 cents a line. Count seven words to the line.**

### FOUNDRY FOREMAN WANTED

BRASS FOUNDRY FOREMAN WANTED. First-class man with up-to-date ideas on machine and bench molding. Must be able to produce good castings from yellow brass and other alloys. Write giving full particulars as to age, experience, etc. Address XYZ, Post Office Box 487, New York, N. Y.

FOUNDRY FOREMAN WANTED TO take charge of foundry department manufacturing heavy and medium line of machines at St. Louis; employ from 4 to 10 molders, steady work. State age, ability and reference. Address Box 829, THE FOUNDRY, Cleveland, O.

FOREMAN WANTED. BRASS JOBBING shop, heavy and light work, also used to machines and can handle men to advantage; good executive ability. State age, experience, wages, etc. Address Box 824, THE FOUNDRY, Cleveland, O.

FOREMAN WANTED FOR MODERN foundry making engine castings. Capacity 20 to 25 tons. A very desirable place for the right man. Address Box 839, THE FOUNDRY, Cleveland, O.

COMPETENT FOREMAN WANTED FOR malleable iron foundry. Address Box 836, THE FOUNDRY, Cleveland, O.

### PATTERN MAKER WANTED

GENUINE PATTERN MAKER WANTED who is not afraid of work, pay will be all that ability can command. Address Box 835, THE FOUNDRY, Cleveland, O.

### SUPERINTENDENTS WANT POSITIONS

POSITION WANTED AS FOUNDRY foreman or superintendent by practical foundryman who has had 18 years' experience in a large foundry making light and medium gray iron castings, also stove plate. Is at present employed, but has good reasons for changing. Address Box 831, THE FOUNDRY, Cleveland, O.

POSITION WANTED AS SUPERINTENDent or foreman by man thoroughly capable of taking entire charge of gray iron foundry making light or medium weight castings. Address Box 815, THE FOUNDRY, Cleveland, O.

POSITION WANTED AS MANAGER OR superintendent of gray iron foundry. Wide experience in handling labor on green and dry sand and loam work. Competent as to mixtures, molding machines and foundry economies. A-1 references. Address Box 827, THE FOUNDRY, Cleveland, O.

### FOREMANSHIP WANTED

**POSITION WANTED AS FOREMAN OR assistant foundry foreman; 32 years old, 16 years in general jobbing foundry, four years of this foreman. Can furnish good references on light and heavy work, green or dry sand. Address Box 780, THE FOUNDRY, Cleveland, O.**

POSITION WANTED BY UP-TO-DATE foundry foreman. Well up on molding machine practice. Can handle men to advantage on any class of work, strictly temperate. Address Box 837, THE FOUNDRY, Cleveland, O.

POSITION WANTED AS FOREMAN IN a brass foundry manufacturing plumbing chandeliers or jobbing. Address Box 838, THE FOUNDRY, Cleveland, O.

POSITION WANTED. A HUSTLING, up-to-date foundry foreman desires to make a change with live firm who are looking for a man with ability and push, capable and willing, light or heavy work. Expert on molding machines. Address Box 830, THE FOUNDRY, Cleveland, O.

POSITION WANTED BY FOUNDRY foreman. Unusually wide experience in foundry practice, familiar with all types of molding machines and thorough knowledge in laying out patterns to fit same. Address Box 828, THE FOUNDRY, Cleveland, O.

POSITION WANTED BY FOUNDRY foreman with firm making high-grade machinery castings. Fifteen years' experience, sober, reliable; A-1 mixer. Open shop preferred. Good references. Address Box 826, THE FOUNDRY, Cleveland, O.

### POSITIONS WANTED, MISCELLANEOUS

POSITION WANTED AS FOREMAN BY patternmaker. Twenty years' experience on all classes of patternmaking. Sweep work, green, dry sand and skeleton work a specialty. Accustomed to all methods, where low cost of production is necessary. Address Box 833, THE FOUNDRY, Cleveland, O.

POSITION WANTED. EXPERT COST accountant and systematizer desires an executive connection with manufacturing concern. Latest methods and satisfactory results guaranteed. Address Box 832, THE FOUNDRY, Cleveland, O.

CHANGE DESIRED BY ORNAMENTAL iron draftsman with seven years' experience in the ornamental iron business and capable of taking charge of drafting room. Address Box 821, THE FOUNDRY, Cleveland, O.

POSITION WANTED BY GRADUATE OF Purdue University in mechanical engineering course; six years' foundry experience. Age 29. Address F. F. Mason, 206 E. Fourth St., Mt. Carmel, Ill.

### BUSINESS OPPORTUNITIES

**INVENTORS ATTENTION: MERITOrious patented foundry machinery manufactured on royalty basis. Long experience and unexcelled facilities for reaching foundry trade. Whiting Foundry Equipment Company, Harvey (Chicago Suburb), Ill.**

### PROPERTY FOR SALE

FOUNDRY AND MACHINE SHOP FOR sale, doing a good business, choice location, no competition. A rare chance at a moderate price. For particulars address Lock Box 105, Chewelah, Wash.

WE HAVE TWO FULLY EQUIPPED forty molder plants and will sell either of them, both running. Splendid location in middle west. Can make satisfactory arrangements. Address Box 820, THE FOUNDRY, Cleveland, O.

SMALL FOUNDRY FOR SALE IN CENtral west, manufacturing a staple article, also doing general foundry business. Can be bought reasonable and on easy terms. Address Box 834, THE FOUNDRY, Cleveland, O.

### BLOWERS FOR SALE

FOR SALE. TWO NEW NO. 9½ GREEN horizontal gas exhausters or blowers; capacity per revolution, 55 cubic feet; 20-inch connections. Two second-hand No. 9-B Green horizontal gas exhausters or blowers. Capacity per revolution, 45 cubic feet, 16-inch connections. For particulars address Sement-Solvay Company, Syracuse, N. Y.

**BLOWER BARGAINS.**
**Roots Second-Hand Blowers, bought, sold, or exchanged for new ones. Address,**
**H. M. PAPWORTH.**
**120-122 Liberty Street, New York City.**

### FLUOR SPAR

FLOUR SPAR—EVERY GRADE, QUOTAtions delivered anywhere. Cheapest suppliers. Address GEO. G. BLACKWELL SONS & CO., Ltd., Liverpool, Eng., or Agents, Penna. Salt Mfg. Co., Pittsburg, Pa.

FLUOR SPAR—BY THE BARREL, TON or car lots. Address American Fluor Spar Co., Paducah, Ky.

FLUOR SPAR, LUMP, GRAVEL OR ground. Washed or unwashed. Guaranteed grades. Prices and samples on application. Address R. L. Moore & Co., Marion, Ky., or eastern agents, E. J. Lavino & Co., Philadelphia, Pa.

### FOUNDRY EQUIPMENT FOR SALE

FOUNDRY EQUIPMENT FOR SALE, used only three years. Write for list. Address Box 814, THE FOUNDRY, Cleveland, O.

### FOR SALE, MISCELLANEOUS

WE SELL THREE KINDS OF FACING only. Our prices the same to all, no cent addition, half cent subtraction methods. Berg Mining Co., 123 Front street, New York, N. Y.

THREE BRANDS ONLY — GERMAN plumbago, Ceylon plumbago, Ceylon silver lead. Twenty years proven. Berg Mining Co., 123 Front street, New York, N. Y.

SQUARE GOODS AND MODEST PROFits have controlled our business for twenty years. Berg Mining Co., 123 Front street, New York, N. Y.

SEVERAL HEAVY CHAIN SLINGS FOR sale, links 4½ in. long, made of ⅞-in. iron. Weighs 7½ pounds to the foot. Morris Machine Works, Baldwinsville, N. Y.

### MOLDING MACHINES FOR SALE

ONE 18 IN. X 22 IN. X 6 IN. POWER ram split pattern molding machine for sale, made by Tabor Mfg. Co., Philadelphia. Is fitted with vibrator and has one pattern plate drilling jig. This machine is brand new and has never been used. The Murray Co., Dallas, Texas.

**TWO ARCADE MOLDING MACHINES for sale at a sacrifice. Acme Steel & Malleable Iron Works, Buffalo, N. Y.**

### CUPOLA WANTED

BARGAIN WANTED IN SECOND-HAND cupola of about five-ton capacity. Must be in good condition. Address Box 94, Syracuse, N. Y.

### FOUNDRY EQUIPMENT WANTED

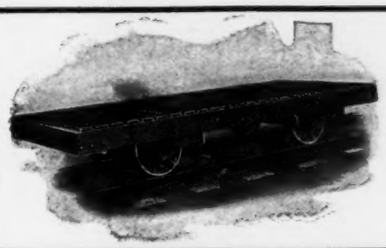
SECOND-HAND FOUNDRY EQUIPMENT wanted, including Cupolas, Ladles, Tumbling Barrels, etc. Quote price and state condition. Address Box 885, THE FOUNDRY, Cleveland, O.

### MOLDING MACHINE WANTED

WANTED. NEW OR SECOND-HAND stripping plate molding machine with table 36 x 30. Kindly advise lowest price, name of maker, state carefully the condition of the machine, how long it has been in service and when bought. Also state where machine can be seen if necessary. Address reply to B., P. O. Box 2062, New York City.

### WORK WANTED

**FOUNDRY SPECIALIST. IF YOU HAVE trouble with your iron call on us. We have a specialist we send out who we know is fully capable of adjusting your difficulties and in a very short time. It will pay you well to consult with us when in trouble. A. Buch's Sons Co., Elizabethtown, Pa.**



FOR SALE **CORE OVEN CARS**

We have in stock for immediate delivery a number of Flat Core Oven Cars which we are offering at a very low price.

*Complete data furnished on application*

**THE ATLAS CAR & MFG. CO.** CLEVELAND OHIO.

**FOUNDRY SIEVES AND RIDDLES**

**COAL AND SAND SCREENS**

**Metal Lockers**

**for Foundries and Machine Shops, Railroad Offices, etc.**

WIRE WORK OF EVERY DESCRIPTION

**Brass, Copper, Steel, Iron and Galvanized**

**WIRE CLOTH**

MANUFACTURED BY

Edward Darby & Sons Co., Inc. 233--235 ARCH STREET PHILADELPHIA, PA.

**STEEL BARRELS AND TOTE BOXES**

**—Made to Order—**

See Catalog 51 See Catalog 51

**THE KILBOURNE & JACOBS MFG. CO., Columbus, Ohio.**

**PATTERN LETTERS**

White Metal and Brass

ALSO WOOD & LEATHER FILLET, DOWELS, STEEL LETTERS, ETC.

Finest goods ever produced.

PRICES LOWEST.

Send for Catalog F

The Cleveland Galvanizing Works Co.

Established 1886

CLEVELAND, OHIO

**"LOST!"**

This is the despairing cry of the company's president when he picks up the yearly statement and hunts for the margin of profit.

Can *you* be certain at the beginning of the year that wrongly figured costs are not constantly eating into what now seems a good profit—and what will only appear as a *loss* one year from now, too late for remedy?

**"Balance Sheet Cost Systems"**

forestall all worry and enable you to know every minute just what you are doing and where you stand.

We have been installing these systems during the past four years, and they have given universal satisfaction.

"Profits *vs.* Losses"—a handsome and valuable monograph—free on request.

**Edward M. Stradley & Co.**

Real Estate Trust Bldg., Philadelphia, Pa.

**BRASS FOUNDERS**

**Practical Informatian Bureau.**

40 years' experience, with trade secrets, from the furnace to the finished work in all known metals, from common brass to the secret process of tempering copper. 40 formulas, worth a thousand dollars.

**Prepaid to any address on receipt of $5.00.**

**JAMES ALLEN, 2453½ Folsom St., LOS ANGELES, CAL.**

SPECIALIST in Mining, Mixing and general preparation of Clays, Sands and Gravels to meet the various conditions required by steel and iron Foundries.

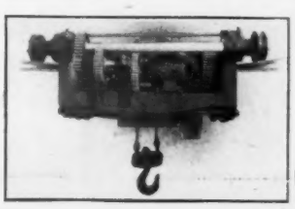
Rail or Water Shipments. Correspondence Solicited.

E. M. HAEDRICH

313 Mariner & Merchant Bldg., Philadelphia, U. S. A.


Alphabetical Index of Advertisers

on page 94 this issue.

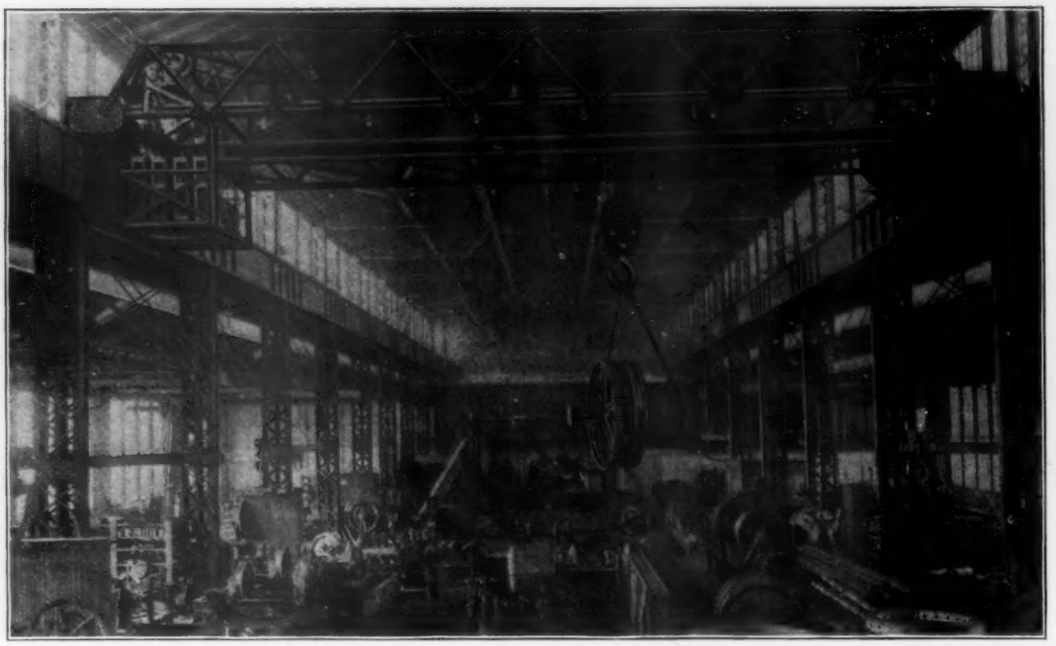



**CLEVELAND CRANES**

*Especially adaptable where the head-room is limited.*

**THE CLEVELAND CRANE & CAR CO.**

Wickliffe, Ohio



"BROWNHOIST" TRAVELING CRANES ARE CRANES OF QUALITY.

**If efficiency, low power consumption and durability are first considerations, we are sure we can meet your views.**

**The Brown Hoisting Machinery Company**

**CLEVELAND, OHIO, U. S. A.**

Branch Offices: New York and Pittsburg.

**Engineers, designers and manufacturers of all kinds of hoisting machinery.**

TRAVELING

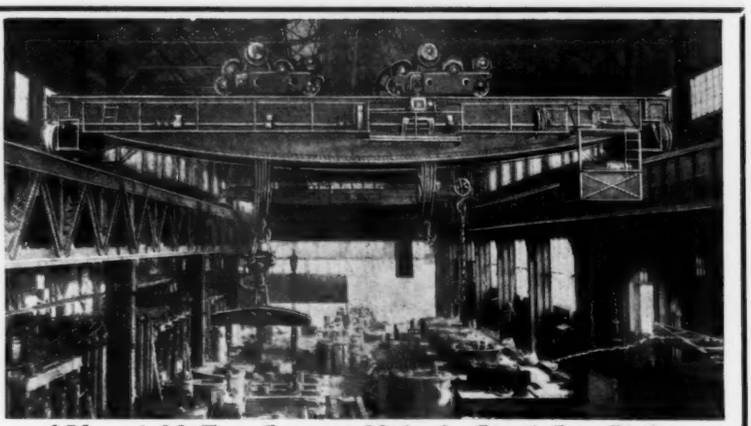
**CRANES**

Designed and Built with a special fitness for

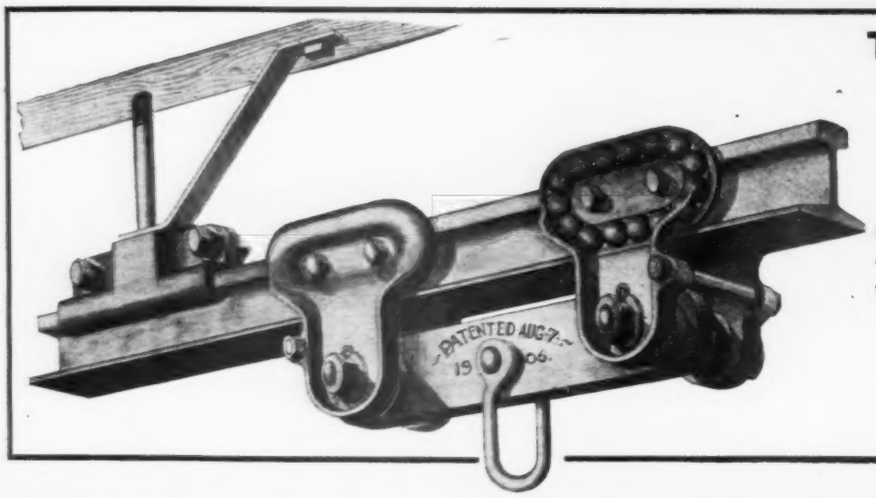
**Foundry Service**

**Pawling & Harnischfeger**

**Milwaukee, Wis.**



**150 and 30 Ton Cranes, Midvale Steel Co., Phila.**




**Trolleys Cranes Conveyors**

**Engineers' Special Machinery Castings Structural Work**

Manufacturers of

**BEST ROLLER BEARINGS MADE**

"Ideal" Patented Industrial Railways

U. S. and Foreign Gov't Contractors

Ordnance Supplies—Fortifications

**C. & W. M'F'G CO.**

**NEW YORK**

Incorporated 1899

# To Make Our Name Fit Our Product

The Name of the Company has been changed from

**THE GENERAL PNEUMATIC TOOL COMPANY**

TO

# Shepard Electric Crane and Hoist Co.

OUR PRODUCT:

**SHEPARD ELECTRIC CRANES**
**SHEPARD ELECTRIC HOISTS**
**SHEPARD PNEUMATIC HOISTS**
**SHEPARD RIVETERS**
**SHEPARD TROLLEYS**

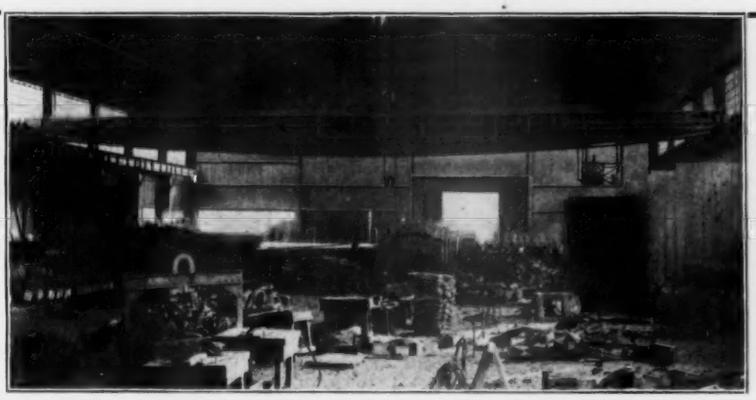
*Write for Bulletins.*

## Shepard Electric Crane & Hoist Co.

**General Offices and Works, MONTOUR FALLS, N. Y.**

New York Philadelphia Pittsburgh San Francisco Toronto Montreal

ELECTRIC
AND
HAND POWER
CRANES
AND
HOISTS



Foundry Cranes
Specially
Built For
Foundry Service

When You Buy a
"Case Crane"
You **GET** the Best

**CASE MFG. COMPANY - COLUMBUS, OHIO**

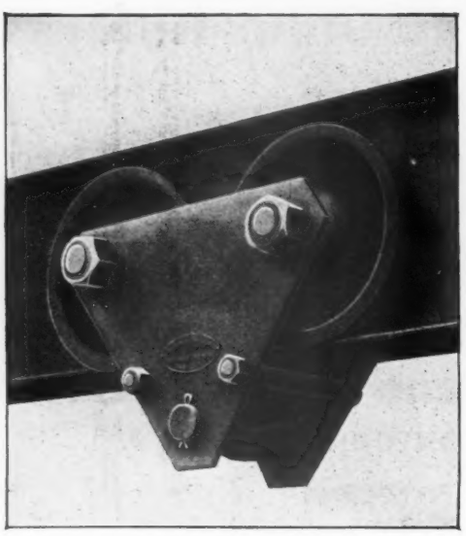
Hand Power Traveling
Crane.
Chain Sprocket Hoist,
two speed lift.

Single
I Beam
Type.

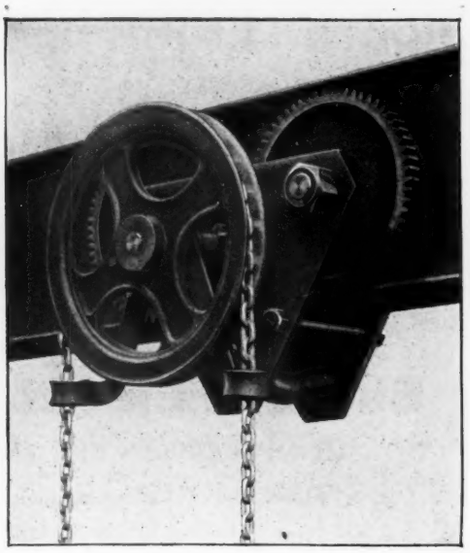
**Maris Brothers**
Philadelphia, Pa.

**CRANES—ELECTRIC AND HAND**

# "LIFTING LIGHT LOADS"
# I-Beam Trolleys
## Plate Frame



PLAIN



GEARED

These trolleys are designed to run on the lower flange of standard I-beams, and are made as light as is consistent with safety. The workmanship and material is the best. The wheels are of cast iron, chilled, with ball face, reducing friction and allowing freest possible running on bevel surface of beam; are fitted with roller bearings and made as large as can be used, allowing sufficient clearance for bolt or rivet heads in upper flange of beam.

DETAILS

| SIZE OF I-BEAM | CAPACITY POUNDS | PLAIN | | | GEARED | | |
|---|---|---|---|---|---|---|---|
| | | WEIGHT | | CODE WORD | WEIGHT | | CODE WORD |
| | | NET | GROSS | | NET | GROSS | |
| 5" | 2,000 | 26 | 36 | Picket | — | — | —— |
| 6" | 3,000 | 32 | 44 | Picnag | — | — | —— |
| 7" | 4,000 | 42 | 55 | Picnic | 82 | 102 | Picrent |
| 8" | 5,000 | 57 | 72 | Picnor | 92 | 112 | Picreck |
| 9" | 6,000 | 78 | 93 | Picture | 133 | 153 | Picribs |
| 10" | 8,000 | 103 | 123 | Pictram | 163 | 188 | Picride |
| 12" | 10,000 | 144 | 164 | Pictrat | 214 | 244 | Picrisk |
| 15" | 10,000 | 178 | 198 | Pictred | 248 | 278 | Picrock |
| 18" | 10,000 | 180 | 200 | Pictros | 250 | 280 | Picrone |

Geared trolleys are furnished with sufficient hand chain for operating on beam twelve feet above floor

## QUINCY, MANCHESTER, SARGENT CO.

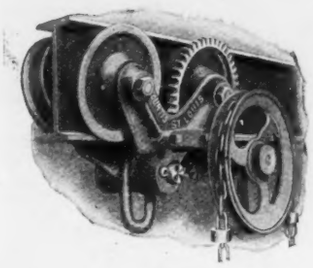
MACHINERY SALES DEPARTMENT

PLAINFIELD, N. J.

CHICAGO
OLD COLONY BUILDING

NEW YORK
WEST STREET BUILDING

# CURTIS ROLLER BEARING TROLLEYS



## WHY THE CURTIS TROLLEY RANKS FIRST

Frames of steel and self-equalizing; wheels have machined tread, run at right angles to flange of beam and are bushed with roller bearings; are figured with large factor of safety and supplied with washers, permitting of being spread for larger size beams.

**CURTIS AIR HOISTS—CURTIS COMPRESSORS—CURTIS TRAVELING CRANES**

## CURTIS & COMPANY MFG. COMPANY

**Operators of the St. Louis Steel Foundry**
**ST. LOUIS, MO.**

New York Office:
A. E. HOERMANN, M. E., 30 Church St., New York

Italian Representative:
ING. A. BALDINI & CO., Pontedera, Italy

# Overhead Track Systems

For Foundries, Machine Shops, and all other Manufacturing Plants where the saving of time and money is a consideration. Simple and easy to operate

*SEND FOR FULL PARTICULARS*

## RANDALL TRAMRAIL CO.

**Allegheny and Trenton Avenues, PHILADELPHIA, PA.**

# The Moyer Tramrail System

¶ Now then, Mr. Foundryman,

¶ We want you to put your time against ours.

¶ We want you to send us a plan of your foundry, drawn to scale, showing the cupola, the girders, the molding floors, the distance from the foundry floor to the underside of the girders; show the position of your core ovens and your rumblers.

¶ And tell us whether carrying metal or sand, or cores, or flasks, or all four appeals to you most.

FIG. 5—TRAMRAIL LAYOUT IN FRONT OF THE CUPOLAS

¶ Then **we** will make up a detailed working plan of your foundry, showing the "MOYER TRAMRAIL SYSTEM" installed.

¶ We will tell you how it can be installed.

¶ We will tell you what the **"System"** will cost you f. o. b. your city.

¶ We'll tell you just where the "System" will save for you.

¶ And how much it will save—and why.

¶ It will cost you very little to send such a plan.

¶ The quicker the "MOYER TRAMRAIL SYSTEM" begins to work for you, the quicker the savings will pile up. So, better send the plan along today. It's up to you now. We're ready.

FIG. 6—RACKS FOR HANDLING CORES

¶ We have just published Bulletin No. 102 showing actual photographs of the Moyer Tramrail System for Foundry use EXCLUSIVELY.

¶ The book shows just how pig, coke and scrap can be carried to the CHARGING FLOOR.

¶ How the HOT METAL and CORES are carried to the MOLDERS.

¶ How the FINISHED CASTINGS go to the rumblers, to the grinders, to the stock bins.

¶ "102" shows the CHEAPEST method known of handling both BRASS and IRON, and a lot of other things of interest to the Foundry Trade.

¶ We'll be glad to send you a copy of the bulletin if you will write us on your LETTER HEAD, just say—

**"Let Bulletin No. 102 come along."**

¶ We'll know what to do.

**MOYER**
**Tramrail Co.**

**P. O. Box 212**

**Harvey, Ill.**

**(Chicago Suburb)**

**CRANES and HOISTS**

**Standard and Special Designs for all Foundry Purposes.**

During the entire business depression our shops have been running full time, with usual help, filling orders for the best Cranes and Hoists, at the lowest price.

*Tell Us Your Needs in Cranes or Hoists.*

**ALFRED BOX & CO.**
**PHILADELPHIA, PA.**

**EQUIPMENT FOR FOUNDRIES---Machinery Only**

**NORTHERN** Electric Hand Pneumatic **CRANES** NEWTON CUPOLAS Trucks Ladles Spring-field **ELEVATORS** Hydraulic Plungers

**INDUSTRIAL TRACK SYSTEM** **OVERHEAD TROLLEYS**

**CORE OVENS** Millett Day Portable Stationary **MOLDING MACHINES** Tabor Pridmore Stearns Pneumatic Hand Squeezers

**STEELE-HARVEY** Brass Bronze Aluminum **CRUCIBLE** OIL Melting Furnace **SLY** Steel Exhaust Cleaning Mills Dust Arresters Iron and Brass Cinder Mills

**NEW ENGLAND ENGINEERING & EQUIPMENT COMPANY,** Weld Building, **BOSTON, MASS.**

**NOW READY**

**The Latest and Most Important Contribution to Foundry Literature.**

# OPEN HEARTH STEEL CASTINGS

By W. M. CARR

FULLY ILLUSTRATED.

In this book are compiled the series of articles which appeared simultaneously in THE IRON TRADE REVIEW and THE FOUNDRY, on the manufacture of Open Hearth Steel Castings.

The following subjects are treated exhaustively---

¶ Selection and representative compositions of melting Stocks, Alloys, Refractories, Fuels and Molding Sands.
¶ Furnace construction and Melting Manipulation of Heats.
¶ Conditions of melting as affecting Physical Properties of Products.
¶ Analyses and Physical Tests of Different Grades of Products.
¶ Effect of Constituent Metals and Metalloids usually present in Open-Hearth Steel Castings.
¶ Heat Treatment of Castings with notes on Microscopic Examinations.
¶ Discussion of the Causes of Blow-holes, Shrinkage, Cracks, etc.
¶ Repairing Defects by Thermit Welding.

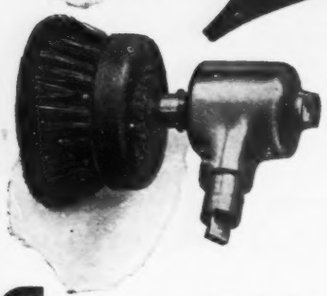
Price $1.50

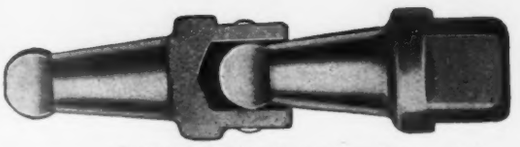
**BOOK DEPARTMENT**

**The Penton Publishing Co.**

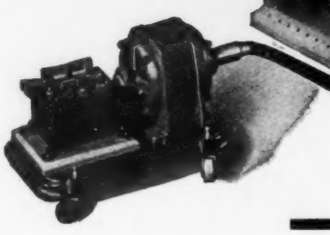
**CLEVELAND**

# COATES





Sections showing the construction of the Coates Flexible Shaft



## Stove Polishing Outfits BELT DRIVEN OR MOTOR DRIVEN

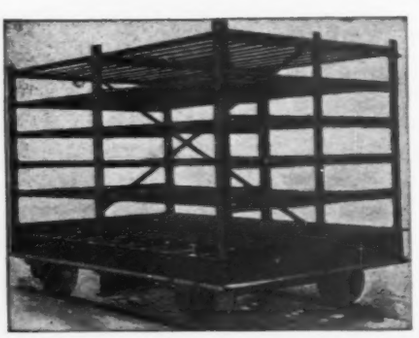
An outfit that pays for itself in a short time. The flexible shaft is made on the unit link ball-bearing type and very strong and flexible.

Stoves like horses attract attention by their shining coats. Get a COATES polisher to produce those shining coats.

The first impression is usually a lasting one. Make your prospective customer remember the superb polish on your stove. *Get after us so that we may get after you.*

**COATES CLIPPER MFG. COMPANY, - - Worcester, Mass.**

## *Industrial Cars and Equipment for the Foundry*

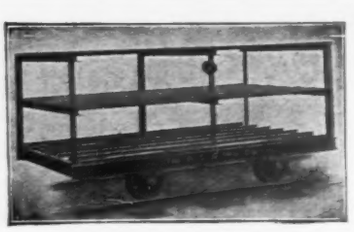


Mould Drying, Core Oven and Pig Iron Cars a Specialty. Also Industrial Track, Turntables, Switches and General Purpose Cars of all kinds. Cars supplied with either Roller Bearings, Oil Box Bearings or Traveling Axles.

*Descriptive Catalogs and Blue Prints furnished on application.*

**The Chase Foundry & Mfg. Co.**

COLUMBUS, O.

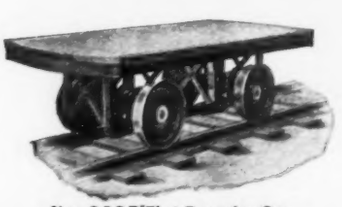


No. 230 Triple Deck Oven Car

## The Atlas Car & Mfg. Co.

**CLEVELAND, OHIO**

**Manufacturers**



No. 2025 Flat Foundry Car

No. 800 Steel Dumping Bucket

**Small Cars of all kinds for various purposes, Sand Buckets, Turntables, Rails, Frogs, Switches, Etc.**

**Foundry Equipment a Specialty.**

## Let us help you solve your grinding troubles . . .

It is very important that you should have the right grade of wheel for your particular work---Many a dollar of profit is lost by trying to make a wheel do work for which it is not fitted. There's a

**Carborundum Grinding Wheel**

that will do your particular work better than any other wheel on earth---our experts will help you find it.

**The Carborundum Co.**
**Niagara Falls, N. Y.**

# How do you do your Hoisting

**In Yale & Towne Chain Blocks** are embodied the final development in lifting mechanism and the highest integrity in Chain Block construction. They lead in efficiency, speed, durability, reliability and universal adaptation to every hoisting requirement.

**Triplex Blocks**—⅛ to 40 tons. Universally recognized as the most durable and efficient Chain Block made. Have balanced train of spur gearing with large internal gear.

**Duplex Blocks**—½ to 10 tons. The handiest and safest Screw Blocks made. Have safety guides to prevent slipping of load chains. Bronze worm wheels and steel worms with hardened and ground thrust bearings running in oil.

**Differential Blocks**—⅛ to 3 tons. Not as durable or easy lifting as the Triplex or Duplex, but safe and twice as durable as the cheaper kind of the Weston Differential Block, because of superior Chain and Sheaves.

Y. & T. Blocks, duplicate parts and trolleys are carried in stock by Hardware, Machinery and Mill Supply Dealers. Write for catalogue.

The Yale & Towne Mfg. Co.
9 Murray Street, New York

# Hauck Portable Burners

Used with great advantage for

**Firing up Cupolas without wood**
**Skin Drying Moulds**
**Drying and Heating Ladles**
**Brazing, Etc.**

We can submit interesting propositions on heating and melting furnaces.

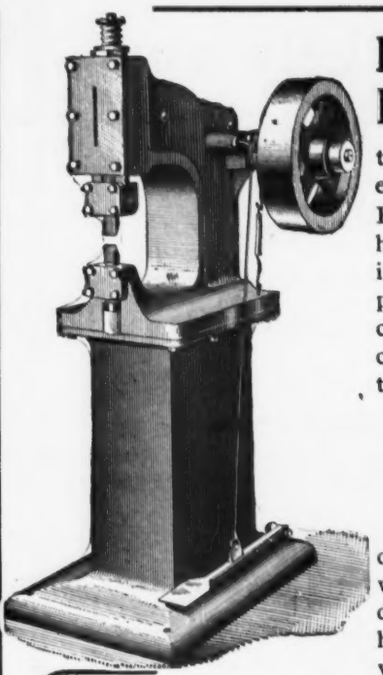
**HAUCK MANUFACTURING CO.**
Richards St. and Hamilton Ave., BROOKLYN, NEW YORK.

# This Sprue Cutter

will trim your castings clean and close—do it quicker and better. Note the 12" throat. It is a strong, substantial machine at a low price that has never failed to give satisfaction and effect a saving.

*Write for Catalog*

**TURNER MACHINE CO.**
2049 North 2nd St., Philadelphia, Pa.



# Don't Hesitate

to invest in whatever saves labor. Every blow of the hammer on the chisel in the old chip, chipping away way of cutting gates from castings trims down the margin of profit.

**A Shuster Power or Foot Lever Sprue Cutter**

operated by one man will do more than a dozen men can in the hammer and chisel way and the castings will be trimmed cleaner and closer.

We make a specialty of building automatic labor saving machinery.

*Catalogue for the asking.*

**F. B. Shuster Company**
Formerly John Adt & Son,
New Haven, Conn.

# OTIS STEEL

## "Otis" Fire Box Plates a Specialty

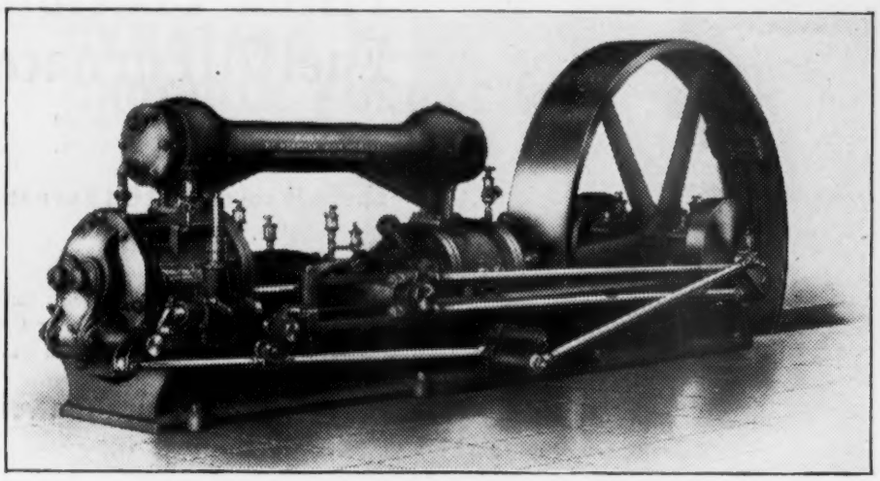
**FLANGE PLATES, SHIP PLATES, TANK PLATES, STEEL CAR AXLES AND FORGINGS OF ALL KINDS**

## Steel Castings from 100 to 100,000 lb.

**Head Office and Works, CLEVELAND, O.**

Agencies: NEW YORK, John Platt & Co., 97 Cedar St.
MONTREAL, Taylor & Arnold, 180 St. James St.
DETROIT, George W. House, Union Trust Building.
SAN FRANCISCO, John Woodlock, 154-156 First St.

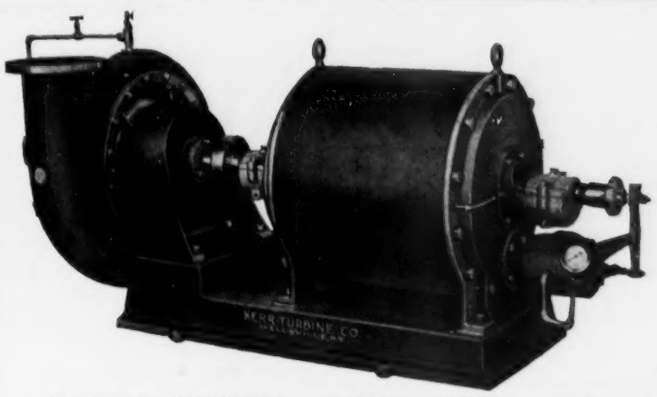
# Belt-Driven Air Compressors for Factory Uses.



Constant Speed, Variable Capacity.
Automatic Regulation.
Can also be instantly cut out by hand.
No extra load or quick belt-breaking strain thrown on machine at moment of unloading or loading.

Inlet valves of Corliss form but without the limitations of ordinary Corliss valves.
Two pressures from the same machine, automatically distributed according to demand.
Many new features of great interest to Mechanics and Engineers.

**THE NORWALK IRON WORKS COMPANY,**
**SOUTH NORWALK, CONN.**



## Kerr Steam Turbine is Right

Every Turbine assembled to suit **operating conditions.** No Oil in Exhaust Steam. Wide Speed range.
**Turbine Pumps** require less attention, oil, space and steam than piston pumps.
**Turbine Generators.** Direct and Alternating current. Standard voltages. Capacities below 300 kilowatts. Regulation right.

**Turbine Blowers for Gas Works, Foundries and Forge Shops.**

Parts in stock for quick delivery. **Start and stop quickly.**

*Write for Bulletin and state requirements.*

**Kerr Turbine Co.,** **Wellsville, N. Y.**

30 Church St., NEW YORK 141 Milk St., BOSTON 1428 Marquette Bldg., CHICAGO 1049 Security Bank Bldg., MINNEAPOLIS
416 New England Bldg., CLEVELAND 616 Union Trust Bldg., DETROIT 320 Second Ave., PITTSBURGH

# Air Compressors

*Send for Catalogue*

Pneumatic Chipping Hammers, Hoists, Casting Cleaners, Sand Blast Machines, Molding Machines and other appliances in foundry work.

**American Air Compressor Works**
**26 Cortlandt St.** **NEW YORK**

## A PORTABLE PNEUMATIC MOLDING MACHINE

**for general jobbing or specialty foundries.**

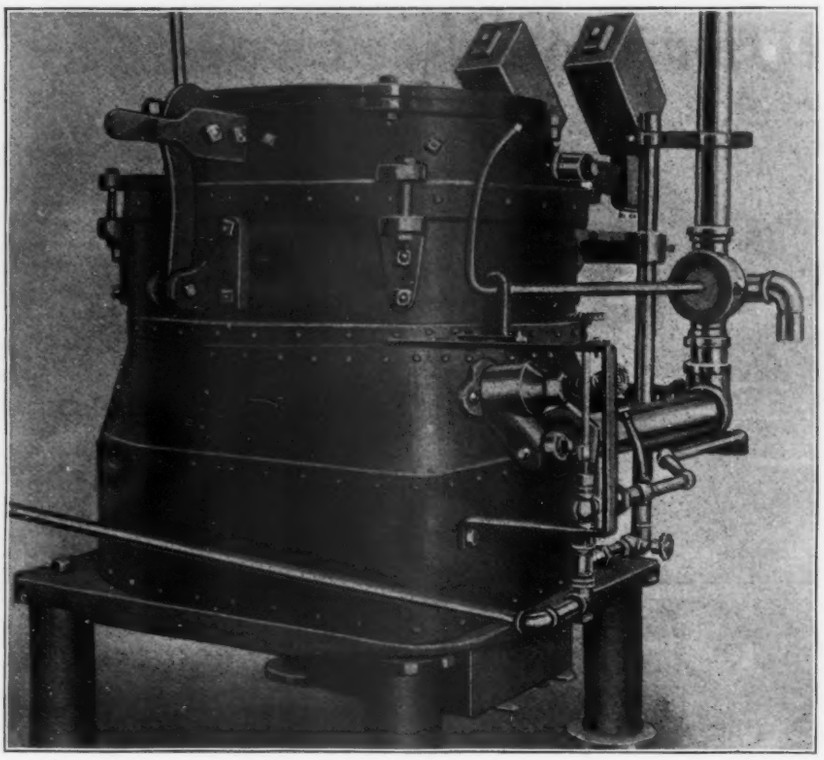
TWO SIZES

30" and 36" used in iron or brass foundries.

Ask for prices.

Manufactured by

**J. F. Webb Mfg. Co.**
**DAVENPORT, IOWA.**



**Improved Double Burner**

# Fisher Crucible Fuel Oil Furnace

Built in sizes from 100 to 300
Crucible Capacity.

**The only successful Oil Furnace on the market.**

We guarantee melting cost from 40 % to 50 % less than with other fuel, with little or no shrinkage in metal. Furnaces of size shown in cut built in batteries of four.

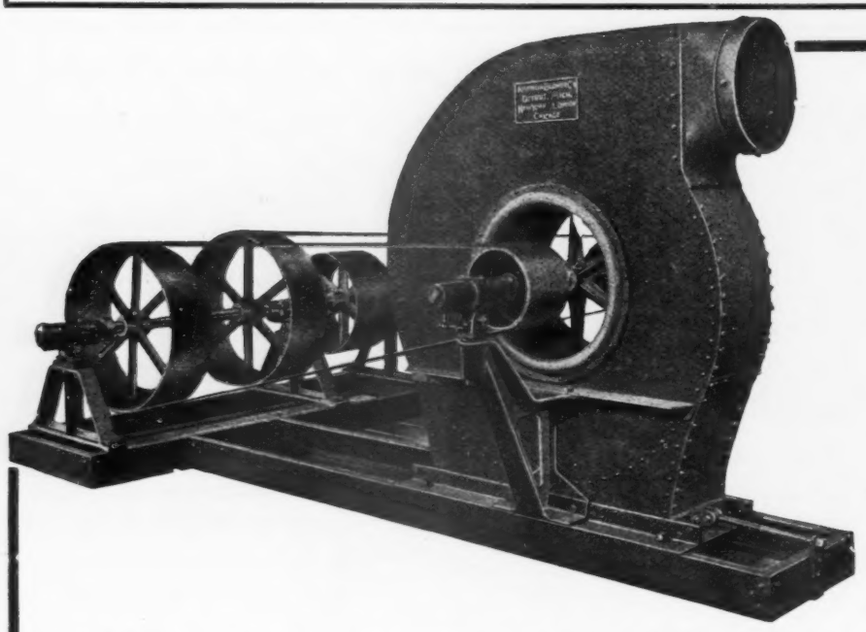
**Operated with one Blower and one Pump.**

**COMBUSTION CHAMBER FOR HEATING CORE OVENS.**

Guaranteed free from fumes or odors. Will heat core oven for 7c a day. Can be attached to any core oven.

A list of firms using Fisher Furnaces will be sent on request.
Address all communications to

**ALFRED FISHER** 103-5-7-9 W. Monroe Street CHICAGO



# What's The Use?

What's the use of paying a big price for a rotary blower when you can get an "ABC" Steel Pressure Blower (Type P) that will give you better service at only a fraction of the cost of a rotary blower of equal capacity. No guess work; established fact. Shall we send you Blower Catalogue No. 190F?

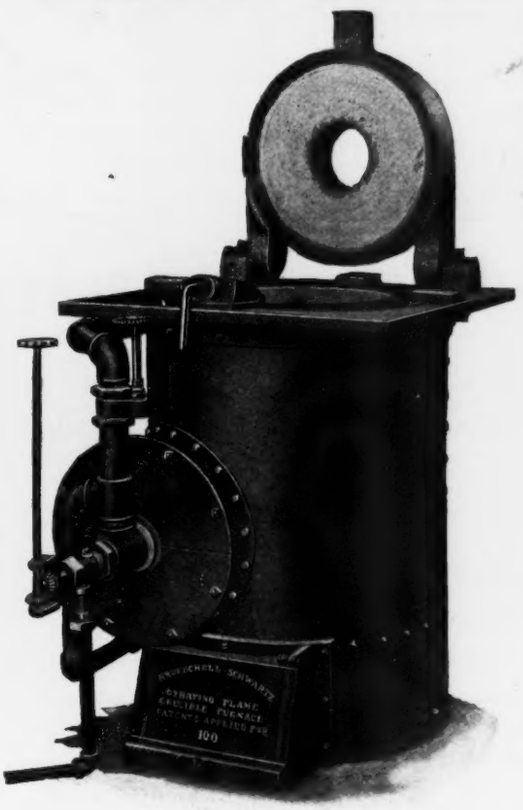
## AMERICAN BLOWER COMPANY

DETROIT

NEW YORK CHICAGO LONDON ATLANTA

# Kroeschell-Schwartz

## GYRATING FLAME CRUCIBLE FURNACE



### FUEL---OIL OR GAS

¶ This furnace can be used for the melting of all alloys of copper, brass and aluminum; ferro alloys, such as ferro manganese, ferro silicon, titanium, etc.; crucible steel, special mixtures of gray iron, such as semi-steel; precious metals, etc.

¶ Oxidation is kept at a minimum, on account of the absolute evenness of the heating of the metals and the perfect control of the flame.

¶ No annoyance from handling coal, coke and ashes.

¶ All spilled metal drops automatically into clean ingot under furnace. **No ash mixture.**

**We claim great fuel economy. Minimum amount of labor in operating. More heats per day than from any furnace on the market. Increased life of crucibles.**

¶ This furnace can be operated continuously, there being no cleaning out of the furnace necessary after removing the pot for pouring and before another pot of metal is placed therein.

¶ The new pot of metal being placed in furnace immediately after removing the heated metal, prevents the cooling of the furnace; after the first heat, each succeeding pot of metal enters a thoroughly heated furnace from the very start, insuring a large saving of fuel.

*Write for further information.*

**KROESCHELL BROS. CO.**

**55 ERIE STREET CHICAGO, ILL.**

## THERMIT IN THE FOUNDRY

¶ It will be found invaluable for repairing castings, welding steel and wrought iron sections, pipe welding and repair work in general. The process should also be used for PURIFYING CAST IRON, for which purpose we manufacture Titanium Thermit Cans suitable for use in the foundry ladle. Treating cast iron with Titanium Thermit, eliminates the impurities, renders the metal more fluid and results in the pouring of castings of greater density and strength.

*Write for Pamphlets 18-T and 11-T which give net prices.*

---

# Goldschmidt Thermit Co.

**90 West St., New York**

**432-436 Folsom St., San Francisco, Calif.**
**103 Richmond St. W., Toronto, Ont.**

*Your Molders should be as well equipped with Tools as your Foundry*

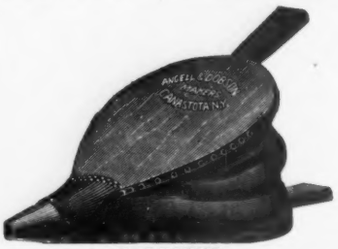
# —MOLDERS' TOOLS—

**Dobson's are perfect in shape, "hang," temper and finish**

**Help your men secure ours**

**WILLIAM DOBSON**

**Maker of MOLDERS' TOOLS**



CALFSKIN

**211-213 Spencer Street**

**CANASTOTA, N. Y.**

The Original Detroit Tool

Business Established 1886

**ESTABLISHED 1875.**

## Stow Mfg. Co.

**BINGHAMTON, N. Y.**

**INVENTORS OF THE**

**FLEXIBLE SHAFT**

**FOR ALL PURPOSES.**

**The oldest and largest manufacturers in the world.**

## PORTABLE EMERY GRINDER

**Take the Tool to the Work and Save Heavy Handling.**

**WRITE US FOR CATALOGUE AND PRICES.**

**General European Agents: Messrs. Selig, Sonnenthal & Co., 85 Queen Victoria St., London, Eng.**

**THE**

## INJECTOR SAND BLAST APPARATUS

**Is a practical machine that fits in with the existing conditions in any foundry WITHOUT SPECIAL INSTALLATION.**

*Write for "Sandcraft."*

**Made by C. DRUCKLIEB,**

**132 Reade St., NEW YORK.**

SALES AGENTS:

Harron, Rickard & McCone, Ltd., San Francisco and Los Angeles, Cal.; Corby Supply Co., St. Louis, Mo.; The E. A. Kinsey Co., Cincinnati, O.; The J. D. Smith Foundry Supply Co., Cleveland, O.; Central Foundry Supply Co., Columbus, O.; W. T. Francis & Co., Pittsburg, Pa.; The Fairbanks Co., New Orleans, La.; Detroit Foundry Supply Co., Detroit, Mich.; Canadian Rand Co., Montreal and Toronto, Canada; Fenwick Freres & Co., Paris, France; Consolidated Pneumatic Tool Co., London, Eng.; Pneumatic Tool Co., St. Petersburg, Russia.

## Peninsular Molders' Tools

are the best in

**Quality, Finish and Temper.**

Made by the

**Peninsular Tool & Specialty Co., Limited**

**Detroit, Mich., U. S. A., and Windsor, Ont., Can.**

## MAHOGANY

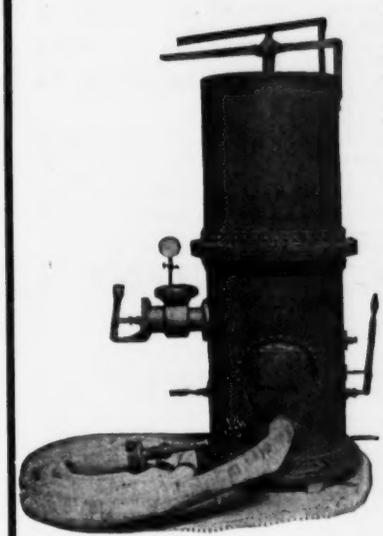
**FOR PATTERN WORK**

Try our special pattern grade---costing no more than white pine. A durable pattern and easy to work.

**LEWIS THOMPSON & CO. Inc.**

**Eighteenth and Indiana Avenue, PHILADELPHIA**

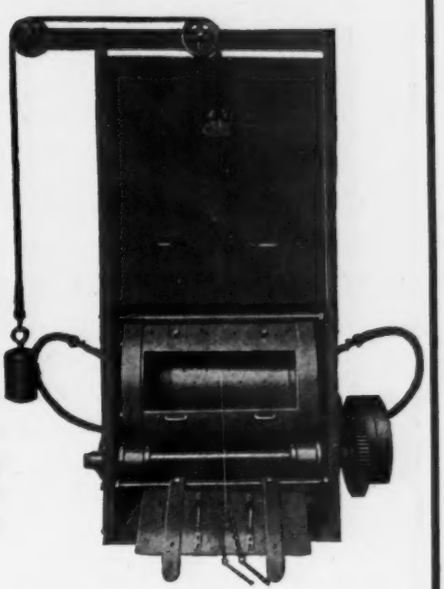
# YOU ARE SKEPTICAL!



Then you want to know **all** the facts bearing on your problem. If the problem pertains to cleaning the output of your foundry, we have some facts of vital interest to lay before you. Do you want them?

## Sand Blast Tumbling Barrels

Commend themselves instantly to the practical foundryman who has taken the trouble to inform himself about them. They **decrease** your operating expenses and **increase** your dividends very decidedly.



*Catalogues and full information sent on request.*

**Tilghman-Brooksbank Sand Blast Company**

**1126 South 11th St., PHILADELPHIA, PA.**

## THE MORSE RAREFIED DUST COLLECTOR

**FOR**

**SAND BLAST—TUMBLING MILLS—EMERY WHEELS—POLISHERS**

**NO REPAIRS IN TWO YEARS**

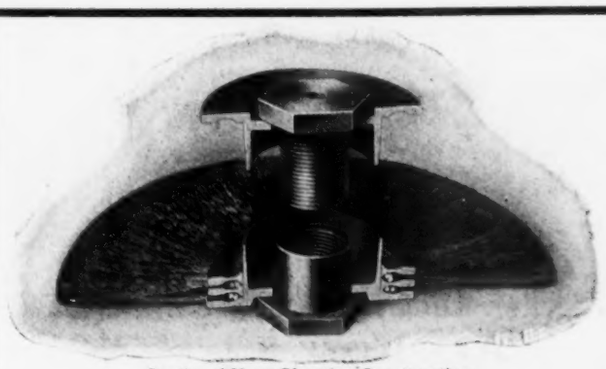
"We have had one of your 'Rarefied' Dust Collectors in our cleaning room for two years. It has done the work perfectly. Previous to using your collector we were obliged to make general repairs on fan every three or four months. Since installing the 'Rarefied' there has been no cutting out of fan or collector. No repairs have been necessary. Your system is the best we have ever seen.

Yours very truly,
LUSK FOUNDRY CO., LTD."

**Manufactured Exclusively by**

**THE KNICKERBOCKER COMPANY**

**Jackson, Michigan**



Sectional View Showing Construction.

## *The Economy Wire Wheel Brush*

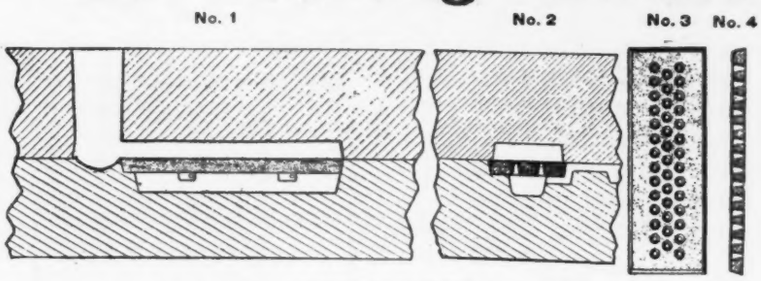
It saves the wages of 4 men. One man with an Economy will do the work of 5 men by other methods and do it better.

For cleaning Castings and every variety of metal work

*Let us tell you more about it.*

*THE OSBORN MANUFACTURING CO.* **CLEVELAND, O.**

# The "Ladwig" Patent Skim Gate




PATENTED OCT. 18, 1904.

No. 772720

No. 1 Shows location and position of Gate in flask.
No. 2 shows receptacle to catch dirt or scoria in the iron.
No. 3 shows screen for passing metal through before entering mold.
No. 4 shows section of screen.
No. 5 shows the device used on snap flask work, on top of cope, in center or corner of flask, using round Gate.
Nos. 6-7 show plan and section of core.
No. 8 shows Gate and core in position ready for metal to be poured in.

## INSURES CLEANER AND PERFECT CASTINGS

**Eliminate Bad Castings and Increase Your Output by Using This Device**

No more expensive than cutting gate with moulders' tools.

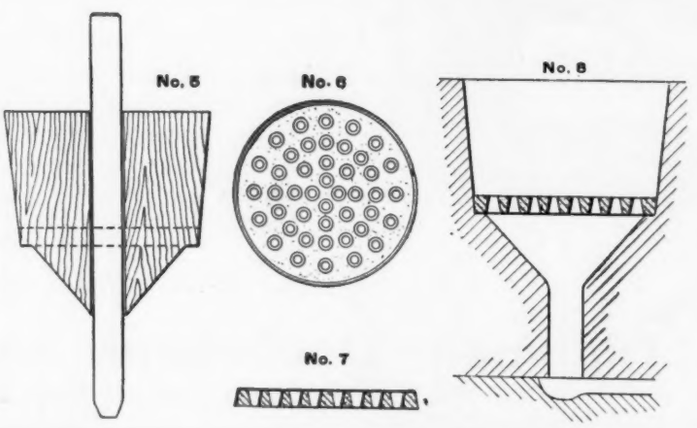
LET US SEND YOU A SET; WE WILL PAY EXPRESS CHARGES BOTH WAYS.

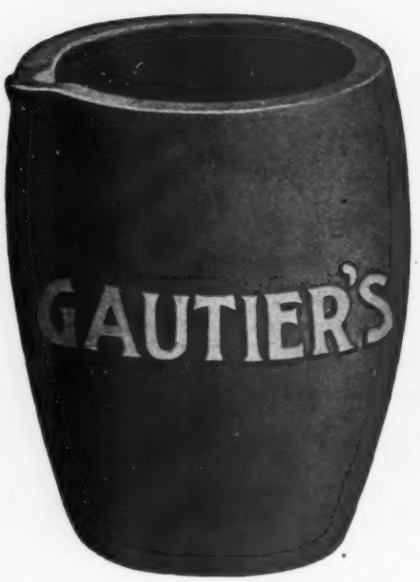
*Infringements will be prosecuted.*

We give 1 small and 1 large gate; also 1 round gate. Small gate will cast 175 lbs. Large gate will cast 1,200 lbs. The round gate will cast 150 lbs. When purchased, make as many as you need for your own shop, but for no other shop.

Shop rights for sale. Address:

**JOSEPH HARRISON**
**318 Walker St. MILWAUKEE, WIS.**




# THE STANDARD

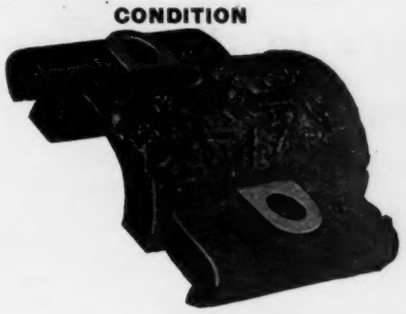
## IN CRUCIBLES

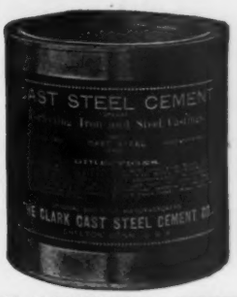
***Time tried***

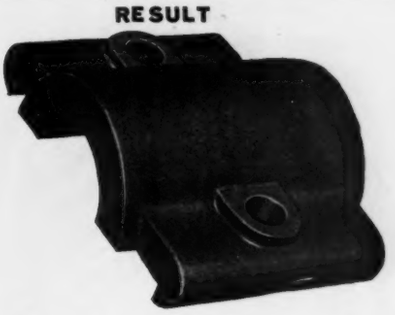
***Fire tested***

**J. H. Gautier & Co.**
**JERSEY CITY, N. J.**

CONDITION REMEDY RESULT





**CAST STEEL CEMENT FOR CASTINGS, STEEL OR IRON. Free Samples.**

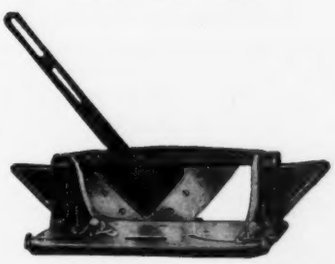
MANUFACTURERS
**THE CLARK CAST STEEL CEMENT CO.**
SHELTON, CONN., U. S. A.

AGENTS
**WHITEHEAD BROS. CO.**
NEW YORK CITY

AGENTS
**J. W. JACKMAN & CO., LTD.**
LONDON, S. W., ENGLAND.

## PATTERNSHOP ECONOMY

MORE THAN
# 16,000
## FOX TRIMMERS
ARE IN USE



**There are Cost Cutting Reasons.**

Get our New Catalog No. 85.

**FOX MACHINE COMPANY**
850 No. Front Street Grand Rapids, Mich.

## Save Your Castings

BY PERFECTING THEM WITH THE BEST METALLIC FILLER MADE,

TRADE
# NOXAL STEEL CEMENT
MARK

Easily prepared and applied; hardens rapidly and firmly; costs but little. Smooth in appearance and is as durable as the casting itself. :-: :-:

*We want to send you a sample for trial.*

**Cleveland Steel Cement Co.**
406 O'Brien Bldg.
CLEVELAND, OHIO

# MAKE YOUR OWN STEEL CASTINGS

You will find it handier and more economical.

*Send for particulars to*

**J. S. McCormick Co.** FOUNDRY SUPPLY DEPOT **PITTSBURG, PA.**

## At the Top

That's where our liquid core compound has been for years and that position of supremacy will ever be accorded our product by foundrymen everywhere.

### Why?

Because we are specialists in the manufacture of this product.

Because we have made a special study of core room requirements.

If you are experiencing any difficulties with your cores we can eliminate them.

### Holland Liquid Core Compound

makes cores that will not break—cores that will not absorb moisture. It is an oil core binder and will make ventless cores.

*A trial convinces.*

**WE ARE NOT INFALLIBLE**

We try to be careful. We are careful, but we make mistakes once in a while. There is no greater favor you can confer on us than to tell us about any mistake we may make in business dealings with you—pleasantly if possible, but tell us anyway. Such information is taken by us not as criticism, but as a kindness. It won't take us long to make the wrong right.

**HOLLAND LINSEED OIL COMPANY**
683-5 Austin Ave.
CHICAGO, ILL.

## Dollars in the Dump
or
## Dollars in Your Pocket?

A Dings Magnetic Separator will put dollars in your pocket which are now going to the dump in the form of foundry refuse.
Magnetic Separators for Iron Foundries, Brass Foundries, Metal Refineries, Mines, and many special requirements.

*Write to us.*

**Dings Electro-Magnetic Separator Company**
MILWAUKEE, WIS.

## HOYT & MARTIN

***Electric Magnetic Separator***

For extracting iron from brass, or other substances, we will put it against any other machine, and beat them out.

Write us.

**The Elm City Engineering Co.**
65 Orange Street
NEW HAVEN, CONN.

Foreign Agents, FENWICK FRERES & Co., Paris, France

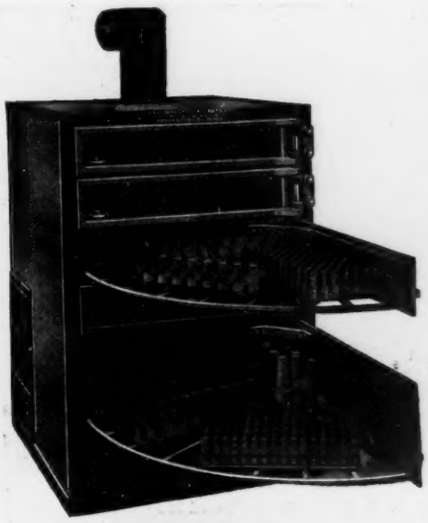
U.S. OR CANADIAN
**PATENTS**
$25.00
We pay all expenses and disbursements except Government fees.

Write to us for preliminary opinions on all legal matters. No charge unless retained.

Associates throughout Continental Europe, Great Britain, the Colonies, South America and Canada enable us to investigate and prosecute foreign interests with dispatch.

*Our Pamphlet for the Asking.*

THE INDUSTRIAL LAW LEAGUE, INC.
170 Broadway, New York City, N. Y.



Fuel economy, Capacity of production, Convenience and Cleanliness are distinguishing features of

# MILLETT CORE OVENS

(Portable or Stationary)

1500 foundries, with similar core room problems to yours, have selected Millett Core Ovens for the best in service.

This fact alone should move you to know more of this successful oven. Write or call on us or our Sales Agents for full particulars.

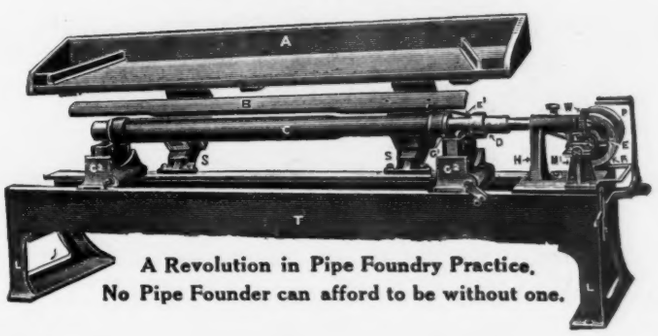
## Millett Core Oven Company

SPRINGFIELD, MASS.

SALES AGENTS:

NEW YORK CITY — Thos. W. Pangborn Co.
PHILADELPHIA, PA. — J. W. Paxson Co.
PITTSBURG, PA. — J. S. McCormick Co.
DETROIT, MICH. — F. B. Stevens
LONDON, ENGLAND, J. W. Jackman & Co.
PARIS, FRANCE, Fenwick Freres & Co.

## W. Jones Patent Core Forming Machine



A Revolution in Pipe Foundry Practice.
No Pipe Founder can afford to be without one.

## For Pipe Cores

2' to 20' diameter

MANUFACTURED BY

**Jones & Attwood**
STOURBRIDGE
ENGLAND

BRISTOL'S RECORDING
## CORE OVEN THERMOMETERS

Located Outside but Register Continuously the Baking Temperatures
Recording Pressure Gauges for Cupola Blast
Write for Catalogue O and list of Users

THE BRISTOL CO., New York — Waterbury, Conn. Chicago

BUYERS ON THE PACIFIC COAST
will find
**Gautier's Black Lead Crucibles**
in stock with

Dealer in FOUNDRY SUPPLIES
A. L. TAYLOR CO. Successor to S. R. Church
9 California St. SAN FRANCISCO CAL.

WAX-WIRE.

Registered Trade Mark.

**A Perfect Core Vent**
is an
**Insurance against Loss from Unsound Castings**

Leaves the vent hole clear and clean
Is perfectly flexible under all temperatures
It melts readily and evaporates quickly
Costs about 5c per 100 lineal foot and upwards, according to size.

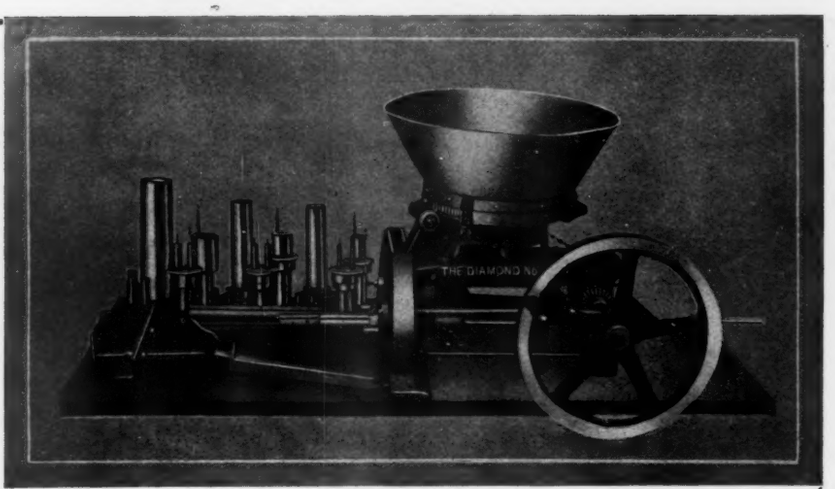
*Samples free on application.*

**ALFRED FIELD & COMPANY**
93 Chambers St., NEW YORK

# Don't Buy a Core Machine

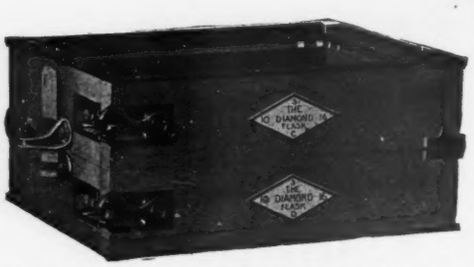
**until you get our new catalog and prices.**

We make all kinds of machines, automatic, power and hand machines that will make any kind of a core that you can make in a box as fast as the operator can take them away.



No. 2 Machine, duplicate cores from ¾" to 1" (Patent allowed May 11, '08)

With our improved hopper, by opening or closing the gate, you can regulate the feed for any size core. The only positive feed on the market.



**THE DIAMOND SNAP FLASK** sold by all supply houses. Ask for the Diamond and get the best. We manufacture and make a specialty of snap flasks and can ship on receipt of order. Send for our telegraph cipher code, whereby you can order 3 flasks giving dimensions, size and depth in ten words.

**THE DIAMOND ADJUSTABLE BALL CLAMP**

The Best on the Market

## DIAMOND CLAMP & FLASK CO.

**Richmond, Ind., U. S. A.**

## FOR PERFECT PARTINGS

ACCEPT NO OTHER

SEE TRADE MARK

Suitable for Bronze, Brass or Any Other Metal

*Working Samples Sent Free Upon Request.*

FAR SUPERIOR TO

**Lycopodium,---Charcoal,---Charcoal Facings**

FOR Straight and Difficult Lifts. Sticky Patterns, Slanting Copes And Deep Chasings

## Perfect Partings

MEAN

**SHARPER CASTINGS** **SMOOTHER SURFACES**
**PERFECT CORNERS** **EASIER LIFTS**

## Doggett's Parting

PERMITS

Swabbing and Slicking—Will not burn off the face of the mould, wash or cut.

**Manufactured by**

## STANLEY DOGGETT

NEW YORK CITY, U. S. A.

**Distributing Agents:**

| | |
|---|---|
| The J. S. McCormick Co., | Pittsburg, Pa. |
| Messrs. S. H. Brand & Co., | Chicago, Ill. |
| Western Foundry Supply Co., | East St. Louis, Ill. |
| Detroit Foundry Supply Co., | Detroit, Michigan |
| Benj. Elliott, | San Francisco, Cal. |
| Frank E. Sutch, | Harrison Bldg., Philadelphia |

# THE "PERFECT" CORE MACHINE.

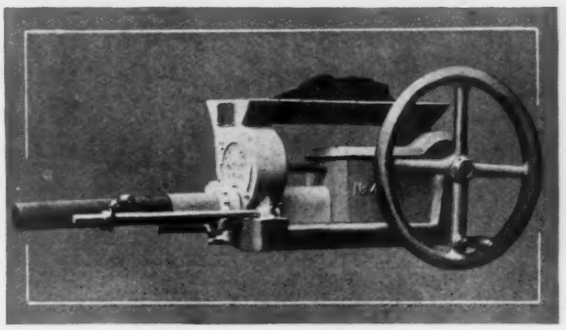
PATENTED IN ALL COUNTRIES

**THE ONLY PERFECT CORE MACHINE IN THE WORLD**

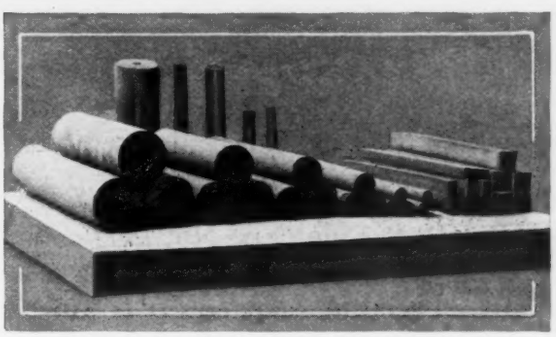
Other types of machines have been replaced by the "Perfect" Core Machine in every foundry in which it has been given a trial.

We have delivered hundreds of "PERFECT" Core Machines during the last few months.

*Write for prices and printed matter.*



THE "PERFECT" CORE MACHINE



CORES MADE ON THE "PERFECT" CORE MACHINE

**Advantages over other types of construction.**

1. By means of a simple adjustment of the vent needle the porosity of the core can be easily regulated.
2. The machine is operated without a screw or other similar mechanism subjected to severe wear.
3. Neither oil nor binder is required in the sand.
4. In most cases a core compound is not required.
5. Good results can be obtained with a poor quality of sand.
6. This machine will outwear any other type.
7. A core 12 inches long, of any section, can be made in 10 seconds.
8. The cores are stronger than those made on any other machine.
9. In addition, this machine possesses all of the advantages of other core machines.

*Agents wanted.*

## Actiebolaget Malcus Holmquist

**HALMSTAD, SWEDEN**

BLACK DIAMOND CORE COMPOUND

## *To introduce our NEW Core Compound we will send you a trial sample free or one ton on approval.*

**Do Not Compare This with Other Compounds on the Market.**

HERE ARE SOME OF ITS POINTS OF SUPERIORITY.

It makes a better core in the green; it bakes out harder and releases from the casting easier.
YOU CAN USE OLD GANGWAY SAND THAT YOU HAVE BEEN PAYING TO GET RID OF.
You can use 30 to 40 parts of sand to one part of "Black Diamond" compound.
It will not swell, crack, blow or buckle.
It will not absorb moisture, makes very little gas or smoke, and leaves a smooth casting.
We will guarantee it to be always uniform.
It can be used in facing sand.

BLACK DIAMOND CORE COMPOUND is made by a firm that has been ten years in the business—that's us. We are experts on Core Flour and Core Compounds and our strongest guarantee is behind the Black Diamond.

ASK US FOR PRICES

## THE MILLERS' PRODUCTS COMPANY

39th AND WALLACE STREETS

CHICAGO, ILL.

# William Sellers & Co., Incorp. Philadelphia, Pa.

## LABOR SAVING MACHINE TOOLS

Our Centrifugal Sand Mixing Machine, belt or motor driven, will disintegrate lumpy sand, and will thoroughly, evenly and quickly mix all kinds of molding sand, core sand and foundry mixtures. This treatment strengthens the sand and increases its porosity.

The actual capacity of the machine is limited only by the facility with which the sand can be delivered to and removed from it.

Our Part Catalogue No. 1800 contains full particulars, and we shall be pleased to send copies to interested parties.

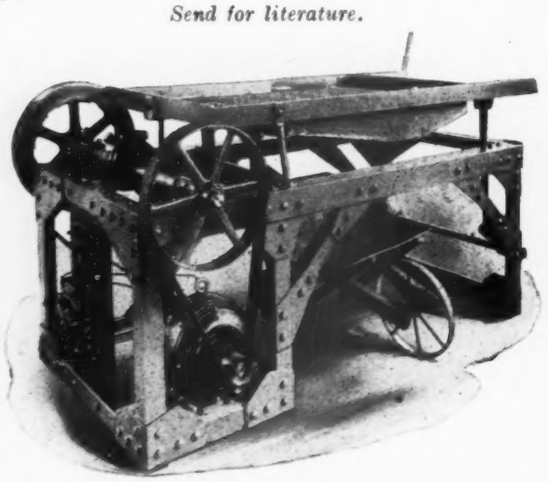
CRANES, SHAFTING, TURNTABLES, INJECTORS, ETC.

## Standard Adjustable Portable Screen Shaker

The strongest, most durable and easy running Screen that was ever offered to the trade.

Furnished with Motor or Tight and Loose Pulley or air driven. The lever at the rear end of the machine is for adjusting the Screen at different angles and to allow the Screen to free itself of rubbish while in motion. Floor space 7′ x 2′ 8″.

*Send for literature.*



**STANDARD SAND & MACHINE COMPANY**

**CLEVELAND, OHIO**

Manufacturers of Mixing, Elevating and Conveying Machinery for Continuous Pouring, also Shippers of all grades of Moulding Sand.

# Lycopart

***The MOST ECONOMICAL PARTING***

A satisfactory, *and the cheapest substitute for Lycopodium.*

The bulk of **"Lycopart"** is such that one and one quarter pound of **"Lycopart"** will do the work of one pound of Lycopodium. And the one and one quarter pound of **"Lycopart"** costs one third, or less, the cost of one pound of Lycopodium,—a saving of 200 per cent., or more.

From an economical standpoint, the above should interest the progressive foundryman. *Non-combustible.* Absolute reproduction of pattern assured.

*Write for Free Sample and price of* **"Lycopart"** *to your SUPPLY DEALER, or to*

**L. J. SWOBODA**

**Manufacturer**

**73 Warren St. New York, N. Y.**

# BURDICK & SON

Manufacturers of

**Patent Stove Dovetails,**
**Hinge Tubes,**
**Door Catches,**

**Cover Lips,**
**Core Chaplets,**
**Screw Shells, Etc.**

Send for samples and prices to

**ALBANY, N. Y.**

# Mr. Foundryman—

Ask us for full details about our new time and money saving device of STARTING FIRE IN CUPOLA without using wood, also for Heating Ladles or Skin-Drying Molds.

We are experts in Brazing of all Metals, especially Cast Iron.

COMPLETE BRAZING OUTFITS furnished, with our own blast and full instructions.

Specialists in

OIL BURNING APPLIANCES

for Foundries and Machine Shops
Write us, we can save you money

**UNITED STATES CHAPLET & SUPPLY CO.**

140 Cedar Street
NEW YORK

Kingsland's Iron Killer Destroys Iron in Brass

Kingsland's Iron Killer Destroys Iron in Brass

"THE MAN WITH THE UMBRELLA"

# Combined Foundry Supply Co.

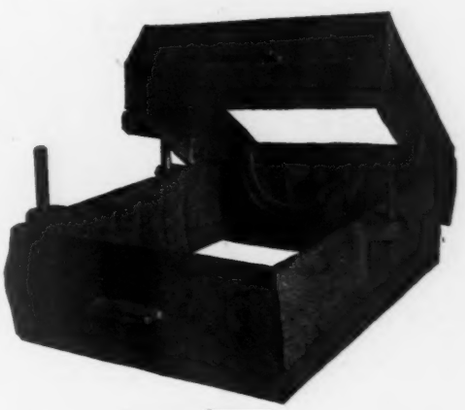
J. S. KINGSLAND & CO., Proprietors

**Foundry Facings and Supplies**
**Albany Moulding Sand**
**Fire Brick and Fire Clay**

766, 768, 770, 772 Grant Street,
BUFFALO, N. Y.

WE DEVOTE all of our attention to making flasks that are absolutely perfect in design and finish.

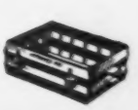
**TALK TO US.**



Patented

# BRASS FOUNDERS SUPPLY CO.

**Flask Specialists**
**NEWARK, N. J.**



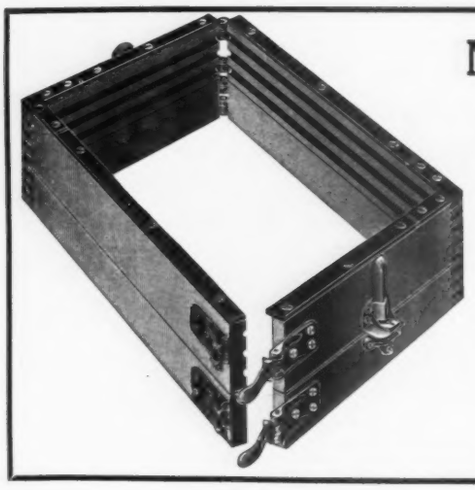
# The Adams Snap Flask

This is one of our odd flasks
Size 14 x 66

¶ We have made the Adams Cherry Snap Flask square, round and oblong, deep and shallow, four sided and eight sided, straight parting and irregular parting, large and small.

***We are Snap Flask Experts.***

**The Adams Company, Dubuque, Iowa, U.S.A.**



## NEW EUREKA SNAP FLASK

**MACHINE LOCK CORNERS**
**ALL MALLEABLE TRIMMINGS MADE IN RED OAK**

*QUICK DELIVERIES*

PRICES

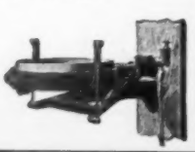
| | | |
|---|---|---|
| All sizes up to 12 x 20 | - - - | $3.00 each |
| All sizes above 12 x 20 | - - - | $3.50 each |

**SMITH & CAFFREY COMPANY**
Successors to C. H. GREEN & CO.
**SYRACUSE, N. Y., U. S. A.**

HANNA SHAKERS
FOR
RIDDLING FOUNDRY SAND

OPERATED BY
AIR
ELECTRICITY
STEAM
DON'T SCREEN YOUR SAND BY HAND

SEND FOR CIRCULAR



HANNA
ENGINEERING WORKS
825 ELSTON AVE.,
CHICAGO

**BYRAM & COMPANY**
INCORPORATED
Makers of
**FOUNDRY MACHINERY**
We are the Pioneers Established 1880
**DETROIT, MICHIGAN,**
**U. S. A.**

# BRASS MOLDERS' FLASKS

## Every Style and Size

Our own foundries ensure prompt shipments.

All our flasks interchange with any of same size made by us.

Furnaces, Drying Stoves, Spill Troughs, Clamps, Boards, Tongs, Crucibles, etc., etc.

**THE OSCAR BARNETT <STANDARD> FLASK**

Is made only by

## Oscar Barnett Foundry Co.

**Founded 1845** **NEWARK, N. J., U. S. A.**

# THE DEANE PNEUMATIC SAND SIFTER

**AN entirely new design of pneumatic or steam shaker for sifting sand wherever compressed air or steam power is available.**

**The air cylinder is an ingenious application of the engine of the Deane steam pump.**

**Apparatus is absolutely reliable under all conditions.**

**THE DEANE sifter is in every way much superior in construction to any other similar device on the market.**

**Apparatus is designed to withstand long and hard usage. There is great power with small consumption of air or steam.**

*Send for Circular*

## THE DEANE STEAM PUMP CO.

**HOLYOKE, MASS., U. S. A.**

## Where will you Buy your Sand this Season?

We can tell you where a big bunch of other Foundries will buy theirs, and the reason why: from

**THE NEWPORT SAND BANK CO.**

**NEWPORT, KY., U. S. A.**

The reason is, because our sand represents **MORE VALUE** for every **DOLLAR EXPENDED,** than **ANY OTHER SAND ON THE MARKET.** Catalogs, samples, and quotations for the asking.

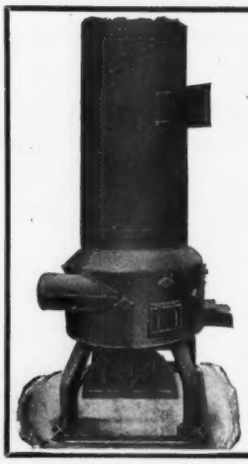
## White Molding Sand

**SAND FOR STEEL CASTINGS**
**FIRE SAND FOR MALLEABLE FURNACES**
**SILICA CORE SAND**
**NATURAL MAGNESIA CORE SAND**

Our Magnesia Core Sand has a Natural Binder and no artificial binder is necessary when using it

*Prompt shipments.* *Write for prices.*

**BALLOU'S WHITE SAND CO.**
**WELLINGTON, ILL.** (On the "Q")



## The EJE Cupola

**COMPLETE FOUNDRY EQUIPMENT**

**Foundries Designed**

**Cupola Linings**

**Edward J. Etting**
**Harrison Bldg.**
**PHILADELPHIA, PA.**

## ALBANY AND NORTH RIVER MOLDING SAND CO.
## ALBANY, N. Y.

**PRODUCERS AND SHIPPERS OF THE WORLD'S BEST MOLDING SAND.**

# LINDSAY CHAPLETS

W W LINDSAY & CO. — PHILADELPHIA PA.

LINDSAY CHAPLETS

HARBISON-WALKER REFRACTORIES CO.
PITTSBURGH, PA.

*Makers*
Highest Grade Refractories

*Importers*
Chrome Ore

*Sole Agents*
Carl Spaeter Magnesite

Fire Clay, Silica, Magnesia, Chrome
BRICK

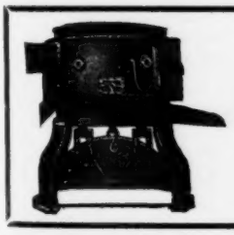
Cupola Linings a Specialty

7,500 Regular Customers — *Write for Booklet F* — 1,200,000 Daily Capacity

CUPOLA LININGS
MADE FROM
High Grade Flint Clays and Bauxite
Especially Adapted for all Metallurgical Furnaces
*Write for Catalogue, covering additional Clay Supplies for foundry uses.*
LACLEDE-CHRISTY CLAY PRODUCTS COMPANY
ST. LOUIS MO., U. S. A.
"CHRISTY" PLANT
Formerly Christy Fire Clay Co.
"LACLEDE" PLANT
Formerly Laclede Fire Brick Mfg. Co.

ESTABLISHED 1856.
HENRY MAURER & SON,
Manufacturers of
HIGH GRADE FIRE BRICK,
420 East 23rd St., New York City, N. Y.
The labor setting 1000 Fire Brick is fully 70% of the cost of material, irrespective of quality; economy in the price of material is like "SAVING at the BUNG, to waste at the SPIGOT."

What lining do you use in your Bessemer and Cupola?
Mica Schist Rock!
If not: Why not?
Lasts longer and costs about one-tenth as much as Fire Brick.
REFRACTORY SUPPLIES.
Fire Brick Fire Sand Silica Sand
WM. PENN SILICA WORKS
Wm. Penn P. O. PHILADELPHIA, PA.


Foundry Equipment and Supplies
FACINGS; COKE; SAND; FIRE BRICK.
THE CENTRAL FOUNDRY SUPPLY CO.
Cor. W. Spring St. and H. V. R. R. COLUMBUS, O.

BROOKLYN FACING MILLS
Partings 1105 Metropolitan Ave. BROOKLYN, N.Y. Partings

Ground, Pea Size and Lump

**80% Ferro - Manganese**

**50, 75 and 90% Ferro-Silicon**

Manganese Copper — Silicon Copper
Phosphor Copper — Manganese Oxide
Foundry Facings and Supplies

**Western Foundry Supply Co.,** 30 Church St., NEW YORK CITY

---

**FERRO-MANGANESE**

Peroxide of Manganese — Silico-Spiegel
Silico-Manganese — Ferro-Silicon

**VIVIAN BOND & CO., 68 Beaver St., New York**

---

GROUND AND PEA SIZE

**80% FERRO-MANGANESE**

**50% FERRO-SILICON**

PULVERIZED

**MANGANESE DI-OXIDE**

FOR BRASS FOUNDRIES — CARLOADS AND LESS

**METALLIC ALLOYS CO.**

Successors to Kendall & Flick

30 Church Street — NEW YORK

---

**FERRO-**

**VANADIUM**

**Prompt Shipment**

Specially made for the FOUNDRY.
Combines readily with minimum loss.
Ferro Alloys, Silicon, Manganese, etc.

**PRIMOS CHEMICAL CO.,**

Primos, Delaware Co., Pa.

Telegram address, Philadelphia.

---

**FURNACES**

OIL, COAL AND GAS FURNACES
OIL AND GAS BURNING APPLIANCES
COMPLETE FURNACE EQUIPMENT

ALUMINUM MELTING.
ANNEALING.
BABBITT MELTING.
BRASS MELTING.
BRAZING.
CORE OVENS.
CRUCIBLE FURNACES.
CUPELING.
DOUBLE CHAMBER MELTING FURNACES.
GALVANIZING.
LADLE HEATING.
METAL MELTING.
MUFFLES.
MOLD DRYERS.
MOLTEN BATHS.
PORTABLE HEATERS.
REFINING.
SCRAP MELTING.
SINGLE CHAMBER FURNACE.
SMELTING.
TINNING.
TUBE BRAZING.
WIRE BAKING.
WHITEMETAL MELTING.
BURNERS (Gas and Oil).
BRICK.
BLOWERS. (Fan and Positive).
HOSE-OIL AND AIR.
KETTLES.
MUFFLES.
OIL PUMPS.
OIL METERS.
PRESSURE GAUGES. (Oil and Air).
RELIEF VALVES.
STORAGE TANKS.
STRAINERS.
STEAM SEPARATORS.
VALVES. ETC. ETC.

**ROCKWELL FURNACE COMPANY**

26 Cortlandt Street, NEW YORK

---

**Write Us For Any Book on Mechanical Subjects**

BOOK DEPARTMENT, THE PENTON PUBLISHING CO., CLEVELAND

# Metals, Machinery and Machine Tools

**We Represent the Following Manufacturers:**

ARMSTRONG & VELEY, Kalamazoo, Mich.

THE AUTO EXCHANGE AND MACHINE CO., Kalamazoo, Mich.

BOWN MACHINE CO., Ltd., Battle Creek, Mich.

THE BURTT MFG. CO., Kalamazoo, Mich.

THE CINCINNATI PLANER CO., Cincinnati, Ohio.

FAY & SCOTT, Dexter, Me.

GRAND RAPIDS BELTING CO., Grand Rapids, Mich.

OLIVER MACHINERY CO., Grand Rapids, Mich.

THE PITTSBURGH AUTOMATIC VISE & TOOL CO., Pittsburgh, Pa.

TURNER MACHINE CO., Philadelphia, Pa.

THE NEW ERA MFG. CO. SPECIAL METALS ALLOYS KALAMAZOO, MICH. U.S.A.

- ☐ Automobile Vises.
- ☐ Babbitt Metals.
- ☐ Band Sawing Machines.
- ☐ Belt Cement.
- ☐ Bench Lathes.
- ☐ Belting.
- ☐ Belt Preserve.
- ☐ Boiler Compound.
- ☐ Boring Bars.
- ☐ Boring Bar Holders.
- ☐ Combination Draftmen's Set:—Calipers, Dividers, Trammels, Beam Compass, Ruling and Bow Pen.

If you are interested in any article listed below, check same, sign and return this ad. We have an offer of exceptional interest to submit to YOU.

- ☐ Drill Press Vises.
- ☐ Gasoline Engines.
- ☐ Hand Screws.
- ☐ Iron Workers' Vises.
- ☐ Machine Tool Holders.
- ☐ Metallic Phosphoro.
- ☐ Pattern Makers' Trimmers.
- ☐ Pipe Vises.
- ☐ Planer Chucks.
- ☐ Planer Centers.
- ☐ Planer Jack Screws.
- ☐ Planer Tool Holders.
- ☐ Sand Sifters.
- ☐ Shaper Centers.
- ☐ Solder.
- ☐ Tapping Machines.
- ☐ White Bronze.
- ☐ Wood Workers' Vises.

NAME

CITY STATE

**THE NEW ERA MFG. CO.,** Manufacturers and Manufacturers' Agents, **Kalamazoo, Mich., U. S. A.**

## Iron and Steel Makers,

## Look Here!

BLACKWELL'S LION BRAND SAM ALLOY

Removes absolutely all flaws and blow-holes in iron and steel castings.

Superior to aluminum at considerable less cost.

**THE PREMIER DEOXIDIZER**

plumbago for facings and all foundry purposes. Fluor Spar for flux. Talc Pencils, etc.

**GEO. G. BLACKWELL, SONS & CO.,** Limited, THE ALBANY, LIVERPOOL, ENG.

**MANUFACTURERS, METALLURGISTS, MINE OWNERS, MERCHANTS**

WORKS: Garston Docks. CODES: A. B. C., Moreing & Neal, Leibers, and Western Union. U. S. A. Agents, Pennsylvania Salt Co., Pittsburg, Pa.

# Electrolytic Ferro-Silicon

**50% - 75% - 95%**

Economical—**dissolves easily** in molten cast iron.
Is added in the ladle **while the iron is being tapped.**
Makes it possible to obtain from **one charge** of the cupola **different grades** of cast iron suitable for various kinds of castings.
**Transforms White Pig Iron into material suitable** for foundry purposes.
**Renders much easier** the machining of castings. **Greatly increases tensile strength and ductility.**

**THE ROESSLER & HASSLACHER CHEMICAL CO.**

**100 William St., New York City.**

# Ground 80% Ferro-Manganese

WE ARE THE PIONEERS IN THIS LINE—been at it a decade. Years ago issued booklets on the subject to the foundry trade. That's how Mr. Indian got on the trail — and began whooping, as over a brand new discovery.

Five years ago we offered ground 50% and 75% Ferro-Silicon and described their value in foundry practice. We received Highest Award, World's Fair, St. Louis, 1904.

We supply all Ferro-Alloys ground, pea size or lumps; in kegs and casks; car loads or less. Quick shipment.

*Write for our booklets, "Manganese in the Foundry," etc.*

**MIDVALE MINING & MFG. CO., St. Louis, Mo.**

Eastern Selling Agents---DEBEVOISE-ANDERSON CO., 95 Liberty St., New York

# Ajax Manganese-Bronze

NOW THE RECOGNIZED STANDARD

The Fact that the United States Government has awarded us a contract for 600,000 lbs.—the largest order ever placed—is sufficient evidence of the character of our product.

Sold in Ingots and Castings by

## The Ajax Metal Company

**Main Office & Works, Philadelphia,**

**Branch Plant, Birmingham, Ala.**

## AMERICAN MANGANESE BRONZE COMPANY

Sole Manufacturers of

**Spare's Manganese Bronze**
**Spare's White Bronze**
**Spare's Hydraulic Bronze**
**U. S. Government Compositions**
**MARINE and AUTOMOBILE CASTINGS**
**Up to 20,000 lbs. each.**

**INGOTS CASTINGS FORGINGS**

99 John Street, NEW YORK

CLEVELAND OFFICE, 1010 Williamson Bldg.

BUFFALO OFFICE, 29 Erie County Bank Bldg.

# FERRO ALLOYS

**For Grey Iron Foundries and Semi-Steel.**

Elements for Softness, Fluidity and Strength.
Greatest Efficiency at minimum cost.
Ladle or Cupola mixtures. Positive results.
Sample 100 pounds on approval.

**BRIGHTON ALLOY MFG. CO.**
**Station B, Cincinnati, O.**

ELEPHANT BRAND

DELTA
REG. U. S. PAT. OFF.

## THE PHOSPHOR BRONZE SMELTING CO., Limited.

2200 WASHINGTON AVENUE, PHILADELPHIA, PA.

ELEPHANT BRAND "Phosphor Bronze"

INGOTS, CASTINGS, WIRE, RODS, SHEETS, Etc.

— DELTA METAL —

CASTINGS, STAMPINGS AND FORGINGS

ORIGINAL AND SOLE MAKERS IN THE U. S.

# ELECTROLYTIC FERRO-SILICON

HIGH GRADE

**50%, 75%, 95%,**

We solicit your inquiries when in the market, both for spot and to arrive.

**The Roessler & Hasslacher Chemical Co.**

100 William St., NEW YORK

# ROYAL PHOSPHOR COPPER

**Two Qualities 10 or 15% Phosphorus Guaranteed**

¶ This deoxidizer has been thoroughly tested and pronounced A1.

¶ The percentage of phosphorus contained is either 10% or 15%, no more, no less. If applied to the same composition results will always be the same. No blow holes and pinholes. No castings for the scrap heap.

ROYAL MANGANESE COPPER
ROYAL SILICON COPPER
ROYAL FERRO SILICON
ROYAL FERRO MANGANESE
and other alloys

SOLE AGENT, **R. F. LANG**
31 BROADWAY NEW YORK CITY

# ORES, METALS AND ALLOYS

**C. W. LEAVITT & CO.**

17 G. H. St. Paul Building
NEW YORK

# GULICK-HENDERSON & CO.

INSPECTING ENGINEERS
METALLURGISTS AND CHEMISTS. ENGINEERS AND FOUNDERS LABORATORIES

**Accurate** and **Quick** analysis assured.
**Our own Power Plant** for Test Machines, Electric Furnaces, etc.
**Practical Mixing** and **Melting Systems Installed.**
**Economies Guaranteed.**

INVESTIGATE. ACT NOW. DON'T WAIT FOR OUR NEXT AD.

*Send for Cupola Melting Bulletin No. 00 and latest Price List.*

General Offices: 439 3rd Ave., PITTSBURG, PA.

# CARR AND SPEER

FOUNDRY AND METALLURGICAL ENGINEERS
120 Liberty St., NEW YORK

We are Steel Foundry Specialists. Before investing your capital in Steel Making Projects, refer your problem to us. You will avoid pitfalls and save money. Our practical experience is at your disposal.

**SMITH, RUDY & COMPANY**

Analytical Chemists and Foundry Specialists

**OUR SPECIALTY—FOUNDRY MIXTURES**

BETTER CASTINGS. LOWER COSTS.
Analysis of Alloys and Foundry Materials at reasonable rates.
*Write for price list and particulars.*

411 Walnut St. PHILADELPHIA, PA.

C. B. MURRAY, President — GEO. P. MAURY, Sec'y & Treas.

**The Metallurgical Laboratory**

**Analytical Chemists and Mining Engineers**

We sample and analyze pig iron and foundry supplies and advise in foundry practice.

**Bailey-Farrell Bldg., Pittsburg, Pa.**

Teaches the mixing of Irons.

Foremen that are in demand are those that mix by analysis.

Foremen that can mix by analysis can command a higher salary than one that has to have a chemist do it for him

**MILWAUKEE CORRESPONDENCE SCHOOL OF FOUNDRY CHEMICAL ANALYSIS**

How to make SEMI-STEEL correctly, gaining from 4,000 to 14,000 pounds tensile strength and 25% in electrical qualities.

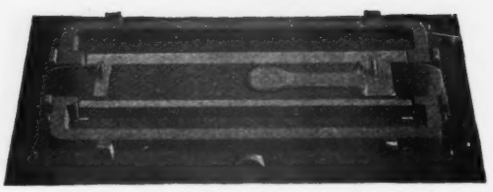
THE ONLY WAY TO REACH FOUNDRYMEN THAT ARE ENGAGED IN THE DAY IS BY MAIL

411 Goldsmith Bldg.
MILWAUKEE, WIS.
Box 206.

LET PRACTICAL FOUNDRYMAN SHOW YOU HOW TO BE A MORE VALUABLE MAN

A Card brings full information

# Use Mechanical Analysis



Iron follow-board with yokes and brass patterns for test bars ½" □ × 12" long.

Iron Flask.

Taper steel scale which measures shrinkage.

For 3 cents and 15 minutes time each day you save hundreds of dollars, and regulate the quality of your castings—It is accurate in the hands of any one.

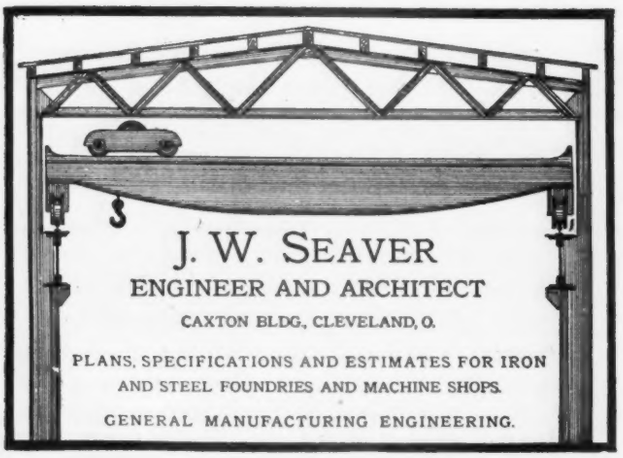
West Newton, Pa.

We would not be without it in running long heats. We test every hour. By so doing we have had no trouble in keeping silicon at proper point.

U. S. RADIATOR & BOILER CO.

*Send for circulars.*

**W. J. KEEP, Detroit, Mich.**



J. W. SEAVER
ENGINEER AND ARCHITECT
CAXTON BLDG., CLEVELAND, O.

PLANS, SPECIFICATIONS AND ESTIMATES FOR IRON AND STEEL FOUNDRIES AND MACHINE SHOPS.

GENERAL MANUFACTURING ENGINEERING.

**Kessler & Wiedemann**
**SAINT LOUIS**

Analytical and Consulting Chemists. Chemical and Microscopical Analyses of Iron and Steel.

**DODGE & DAY,**
**Engineers**
MECHANICAL ELECTRICAL ARCHITECTURAL
Layout, Design and Supervision of Foundry Building Construction and Equipping
PHILADELPHIA, PA.

# LEADING PIG IRON DEALERS' DIRECTORY


**DEBEVOISE-ANDERSON CO.**
95 Liberty St., NEW YORK CITY

**Pig Iron COKE Coal**

FRANK SAMUEL
Harrison Building
PHILADELPHIA

**PIG IRON COKE**

All Grades Cast Scrap Iron for Cupola Use.

**Ground 80% Ferro-Manganese**

J. K. DIMMICK & CO.

**PIG IRON, STEEL and COKE**

2022-2023-2024 New Land Title Bldg.,
PHILADELPHIA

**SOLVAY COKE**
For Foundry, Furnace and Domestic Use.
Ovens at Detroit.

BAIRD & WEST, Sole Selling Agents,
Detroit, Mich.

MATTHEW ADDY & CO.,

CINCINNATI ST. LOUIS
PHILADELPHIA

AGENCIES:
Chicago Detroit New York Pittsburg

F. A. GOODRICH & CO.
INCORPORATED

**PIG IRON, STEEL, COKE, ETC.**

DETROIT, - - - - MICH.

NASH, ISHAM & CO.,
SUCCESSORS TO **DALTON, NASH & CO.**

**PIG IRON AND COKE**

AGENTS FOR
Low Moor, Swede, Trussville, Chattanooga, Woodward, Franklin, Pig Iron and Hostetter Coke.

82 to 92 Beaver St., - - - - - NEW YORK
621 Board of Trade Bldg., - - - - BOSTON

THE THOMAS FURNACE CO.
MILWAUKEE, WIS.

**STRONG FOUNDRY IRON**
FOR QUICK SHIPMENT.

ROGERS, BROWN & CO.,

CINCINNATI, CHICAGO, BUFFALO,
PHILADELPHIA, - - - - - - CLEVELAND,
NEW YORK, - - - - - - - BOSTON,
ST. LOUIS, - - - - - - - SAN FRANCISCO.
PITTSBURG, - - - - - - - BIRMINGHAM.

Superior Charcoal Iron Co.
MANUFACTURERS OF
**Lake Superior Charcoal Pig Iron**
Grand Rapids, Mich.

**CHAS. G. SHEPARD**
**401 ELLICOTT SQUARE, BUFFALO, N.Y.**
**PIG IRON**
**FERRO-SILICON**

## LEADING PIG IRON DEALERS' DIRECTORY


# "MIAMI"
# Foundry Iron

**SOFT - STRONG - UNIFORM**

Also Malleable, Bessemer and Basic

MADE BY

**The Hamilton Iron & Steel Co.**

**HAMILTON, OHIO**

Sales Agents:

WALTER-WALLINGFORD & CO.

Pittsburgh, Pa. Cincinnati, Ohio

J. J. MOHR & SON

**Pig Iron, Coke, Coal and Ores**

BULLITT BUILDING, PHILADELPHIA, PA.

**S. BIRKENSTEIN & SONS**

Brass Foundry Supplies and Buyers and Sellers of New and Old

**METALS**

OF ALL DESCRIPTIONS.

**64-74 E. Ontario St., CHICAGO**

**"Buyers of Foundry Residues."**

## HOW DOES YOUR CUPOLA WORK?

Is your iron slow in coming down? Does it come dull? Does it require more than eight or ten minutes after the blast is put on before the iron shows itself at the tapping hole? Does your cupola get black at the tuyeres? Does it melt irregularly, sometimes hot, sometimes dull, again slow, and then fast? Does your cupola bung up so that you can't run it to the full capacity of your shop? Does the bottom drop easy, or is it hanging there after the doors fall? Do you burn out the lining of your cupola sooner than you should? You will find the remedy for it all in the "CUPOLA FURNACE," the only practical book on the market dealing with modern cupola practice exclusively. The man who wrote the "CUPOLA FURNACE" melted iron for many years, in numberless different cupolas, under all kinds of conditions. His experiences are chronicled in this book, and if you are not one of those fellows who know it all, it will be a rare treat for you to read it.

**360 pages, fully illustrated, $3.50**

**CAST IRON**

A Record of Original Research. By Wm. J. Keep, Member American Society of Mechanical Engineers and of its Committee on Standard Tests and Methods of Testing Materials.

Contents—Definitions. Graphic Records. Methods of Investigation. Crystallization. Carbon. Silicon. Shrinkage. Sulphur. Keep's Cooling Curves. Manganese. Segregation. Strength. Impact. Graphic Approximation of Strength. Hardness. Mechanical and Chemical Analysis Will Not Account for All Physical Properties. Test Bars. Keep's Test Apparatus. Pig Iron and Silicon Iron. Testing Small Samples of Iron. Aluminum in Cast Iron. Various Metals in Cast Iron.

**225 pages, 117 illustrations. Cloth, $2.50**

**Book Department** **The Penton Publishing Co.** **Cleveland**

## LEADING PIG IRON DEALERS' DIRECTORY

# Cherry Valley Iron

We make a specialty of Soft, Uniform, Strong

## FOUNDRY IRON

and study the individual requirements of our customers. Our Ores and Coke are selected with this end in view.

## United Iron & Steel Co.

Successors to
THE CHERRY VALLEY IRON CO.
PITTSBURGH, PA.

**Cherry Valley Furnace**
Leetonia, O.

**Fannie Furnace**
West Middlesex, Pa.

---

F. B. STEVENS,
**FOUNDRY SUPPLIES**
Connellsville Coke for Quick Shipment
DETROIT, - - - - MICH.

---

WALTER-WALLINGFORD & CO.
SUCCESSORS TO
*Thos. A. Mack & Co.*
**PIG IRON AND COKE**
1412-13 Traction Bldg., CINCINNATI
Farmers Bank Bldg., PITTSBURGH

---

PICKANDS, MATHER & CO.,
**PIG IRON,**
**IRON ORE, COAL AND COKE**
CLEVELAND, OHIO.

---

STANDARD CONNELLSVILLE
LOW SULPHUR
**FOUNDRY COKE**
J. H. HILLMAN & SON,
Frick Building, - Pittsburg, Pa.

---

McKEEFREY & COMPANY
**PIG IRON,**
**COAL AND CONNELLSVILLE COKE**
LEETONIA, OHIO

---

PILLING & CRANE,
**PIG IRON AND COKE**
PITTSBURG
NEW YORK
PHILADELPHIA
BOSTON

# The Last Half.

¶ The last six months of 1908 have started in good shape.

¶ I hope they look well to you and that in passing we may all have reasons to congratulate ourselves that we were "on the job" when they rolled by.

¶ Talking about the job! How is that stock of iron, and what is the outlook for your order book?

¶ Just because things may have been a bit below normal for some time past—don't hesitate.

¶ There has been a lot of buying going on recently, and if you have a particular leaning toward any one, two or three brands, it is best to be sure you are going to have a supply of these coming along when you will need them most.

¶ Prepare for your supply of iron and coke. Buy at the low ebb of prices and profit accordingly.

¶ I want to see everybody happy during the last six months.

THE SALESMAN.

---

## Rogers, Brown & Company

New York
Cincinnati
Chicago
Buffalo
Philadelphia

PIG IRON AND COKE

We represent 50 brands of PIG IRON produced in thirteen different states.
Also
30 brands of 72-hour foundry and furnace COKE, Connellsville, Virginia, Pocahontas, New River, West Virginia, Tennessee and Kentucky Districts.

Boston
St. Louis
Cleveland
Pittsburg
Birmingham

# "Cyclone" High Speed Chain Hoist

**WITH SELF-LUBRICATING BEARINGS**
**ALL CUT GEARS**

**1½ Tons to 16 Tons Made as Above—½ Ton and 1 Ton are Made With Single Load Chain.**

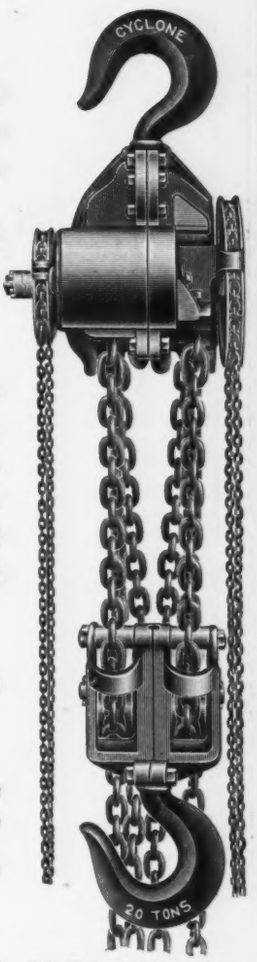
**The Bearings of the Hoist have GRAPHITE BRONZE BUSHINGS. They are self-lubricating, they require no oil, and will run indefinitely without cutting.**

These hoists will raise a load of two tons to a height of one foot with a pull of 125 pounds while overhauling only 39½ feet of hand chain.

As you would have to overhaul at least 90 feet of hand chain to do the same work on the best Screw Hoists, it is plain that the CYCLONE is more than twice as fast. It can be geared to a higher speed than any other hoist with no greater hand wheel pull. **There is the least possible friction loss, the efficiency averaging nearly 80 per cent.**

When there is no load the hand wheel may be spun in either direction.

When the hand chain is released the **Automatic Brake** immediately locks the block so that the load is safely held at any point. It may be readily lowered, however, by a reverse pull on the hand chain.




**20 Tons Capacity Having Two Hand Wheels and Two Speeds.**

WE WILL ACCEPT FIRST ORDERS SUBJECT TO APPROVAL AFTER TEN DAYS' TRIAL

**Sectional View**

*Send for Catalog Illustrating Full Line of Hoists and Trolleys*

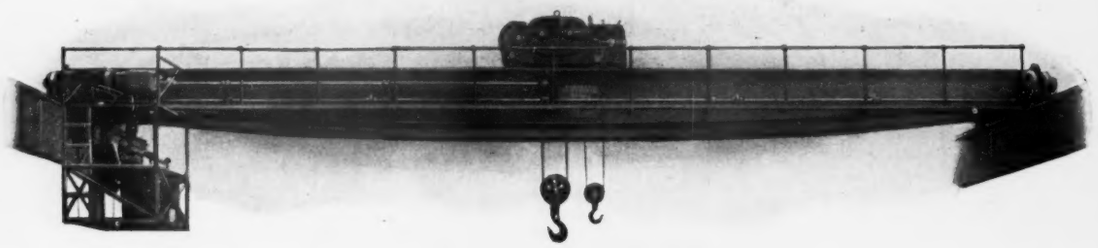
# THE CHISHOLM & MOORE MFG. CO.

**CLEVELAND, OHIO, U.S.A.**

**Sectional View**

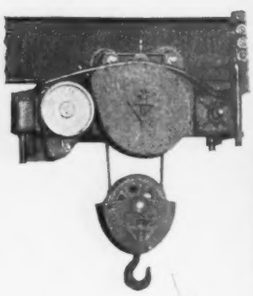
# The Northern Bulletin

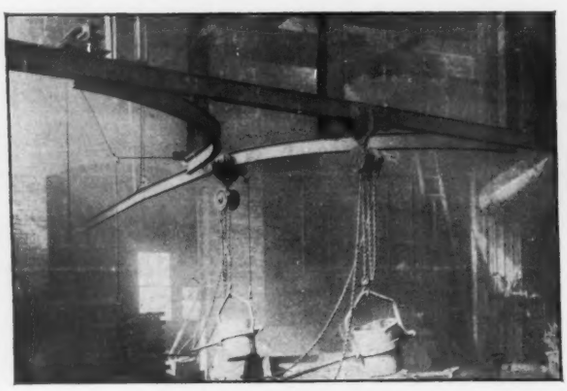
## NORTHERN ENGINEERING WORKS,
DETROIT, MICH. U.S.A.

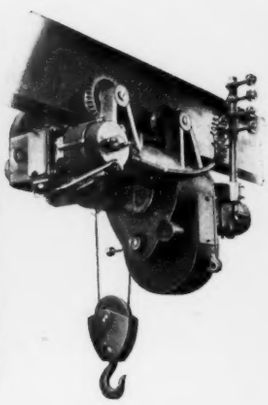


**FOR THE FOUNDRY** **NORTHERN CRANES** **FOR THE FOUNDRY**

If there is any Electric Crane made, the standard construction of which exactly meets the peculiar conditions of foundry service, that Crane is "The Northern". Every detail of it will bear the closest scrutiny by the man who is responsible for results in the shop. Strength, accessibility, protection, safety to employees, accurate and high class workmanship—all contribute to make it ***the perfect Foundry Crane.*** We also make many other types of cranes—jib and traveling—all of the top grade Northern quality.







### ELECTRIC TROLLEY HOISTS AND OVERHEAD TRACKS

We make an efficient overhead track and trolley system and will send estimates on it adapted to your requirements if you will write us.—We make many styles of Electric Hoists—all good. Also Air Hoists.

## NORTHERN ENGINEERING WORKS,
DETROIT, MICH. U.S.A.

**Works and Office, 4 Chene Street**

THE NEWTEN CUPOLA AND FOUNDRY MACHINERY OF ALL KINDS.